INSTRUCTION MANUAL

MODEL 2001A/B

SWEEP/SIGNAL GENERATOR

WAVETEK® INDIANA INC.

66 N. 1ST AVENUE, P.O. BOX 190

BEECH GROVE, INDIANA 46107

317—783-3221

Serial No._____

INSTRUCTION MANUAL

MODEL 2001A/B

SWEEP/SIGNAL GENERATOR

This instrument was provided for
the FAA under contract Number FA71WA-2675
Dated 30 June 1971

WAVETEK INDIANA INC.

66 N. 1ST. AVENUE, P.O. BOX 190
BEECH GROVE, INDIANA 46107
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GUARANTEE

(a) Wavetek, Indiana guarantees each item delivered under the contract against defects in design, material or workmanship, and against any damage caused prior to delivery to the Government. Unless otherwise specified, this guarantee extends for a period of one year from the date of first use by the Government or two years from date of delivery, whichever first occurs.

(b) Upon notice in writing, Wavetek shall promptly repair or replace all defective or damaged items delivered under the contract, f.o.b. any point or points designated by the Government within the 48 contiguous states and the District of Columbia, at no cost to the Government. Wavetek may elect to have any replaced item returned to his plant at his expense.

(c) Unless they fail as a result of improper application by Wavetek, electron tubes, batteries, natural rubber and material normally consumed in operation are excluded from this guarantee, but shall in any event be guaranteed by Wavetek to the extent of any guarantee received by Wavetek from his supplier.

(d) If twenty percent (20%) or more of the total quantity of any part or component to which this guarantee applies (but not fewer than two of any such part or component) fails in normal service, that fact shall be conclusive evidence that the design, material or workmanship of the item delivered under the contract is unsuitable for the purpose intended. Upon notice of this failure rate, Wavetek shall: (i) replace all quantities of the part or component with a corrected part or component in a manner satisfactory to the Government and at no cost to the Government; and (ii) if necessary to insure correction of the deficiency, redesign the item delivered under the contract, or any portion thereof, in a manner satisfactory to the Government and at no cost to the Government. The provisions of this paragraph (d), however, shall not apply to any part or component to be furnished which is specifically identified in the contract by brand name; provided, however, that Wavetek shall guarantee such part or component to the extent of any guarantee received by Wavetek from his supplier.

(e) For a period of one year from the date of its first use by the Government or two years from the date of its replacement or redesign, whichever first occurs, each item (or portion thereof) or part or component, which is replaced or redesigned pursuant to paragraph (d) above, shall itself be guaranteed in accordance with the terms of paragraph (d).

(f) The guarantee periods specified herein shall exclude any period of time an item fails to perform satisfactorily due to defects or damage to which this guarantee applies.

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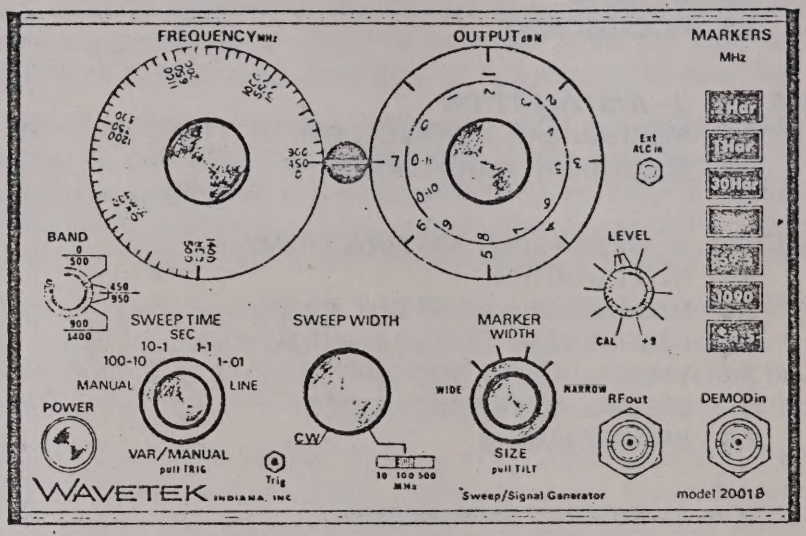


FIGURE i—MODEL 2001B SWEEP/SIGNAL GENERATOR

SCOPE OF THIS MANUAL

This manual provides descriptive material and instructions for the installation, operation, maintenance, and repair of the WAVETEK Model 2001A/B Sweep/Signal Generator.

SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

The Wavetek Models 2001A and 2001B are compact sweep and marker generators. They cover the frequency range of 1.0 to 1400 MHz in 3 overlapping bands. The instruments are identical except for the marker frequencies. The Model 2001A contains markers at 0.2, 1, 5 and 20 MHz harmonics and single frequencies at 62.1, 62.65, 63.0, 63.35 and 63.9 MHz. The Model 2001B contains markers at 0.2, 1 and 30 MHz harmonics and single frequencies at 55.0, 59.5, 64.0, 1085.5, 1090.0 and 1094.5 MHz.

Since the majority of circuits are contained in plug-in modules, maintenance problems can be greatly simplified by stocking several modules instead of hundreds of discrete components.

This plug-in modular concept also enables the instrument to be economically updated to meet future requirements.

A rear panel connector permits remote programming of center frequency, sweep width and output level, plus, external amplitude and frequency modulation.

1.2 SPECIFICATIONS

TABLE 1-1. SPECIFICATIONS

RF SPECIFICATIONS

Frequency Range	1 to 1400 MHz in three overlapping bands 1 to 500 MHz 450 to 950 MHz 950 to 1400 MHz
Operating Modes	Sweep and CW
Frequency Dial Calibration	10 MHz intervals
Accuracy	10 MHz or 2% of selected frequency which ever is greater
Vernier Frequency Control	±5 MHz
Sweep Width	50 KHz to 500 MHz
Display Linearity	2%.
Spurious Signals	At least 26dBm below the output from 10 to 1400 MHz
Residual FM	Less than 15 KHz
Drift	100 KHz/5 minutes—2 MHz/8 hours (after 1/2 hour warm-up at a constant ambient, and allowing a 5 minute stabilizing period after a frequency change)
Blanking	Retrace blanking of the RF output provided for sweep operation. Removed for CW operation.
RF Output	Continuously adjustable from +9 to −81dBm 70 dB in 10dB steps 11dB in 1dB steps 9 dB vernier } 20dB Vernier (11dB of the 20dB vernier range is programmed in 1dB steps by a front panel rotary switch and fixed resistors. The remaining 9dB of the attenuator range is programmed by the front panel LEVEL potentiometer).

TABLE 1-1. Specifications (Con't.)

	ACCURACY OF 0-70dB ATTENUATOR	ACCURACY OF 0-11dB ATTENUATOR
	±0.5dB to 500 MHz ±1dB to 1000 MHz ±2dB to 1400 MHz	±0.5dB to 500 MHz ±1dB to 1000 MHz ±2dB to 1400 MHz
Flatness at +9dBm	±0.5dB from 1 to 1400 MHz when read with a negative detector ±0.75dB from 20 to 1400 MHz when read with RF power meter	
Output Impedance	50 ohms	

REMOTE PROGRAMMING

A Rear Panel REMOTE Jack provides necessary connections for Remote Control of Frequency, Sweep width and the 0 to 20 dB Vernier output control. This jack also provides connections for EXTERNAL Amplitude and Frequency Modulation.

Frequency	May be remotely programmed by a ±16 volt signal (−16 volts corresponds to LOW frequency band end and +16 volts to HIGH frequency band end).
Sweep Width	May be controlled by a remote potentiometer, (Input and output connections provided in Rear Panel REMOTE jack).
Vernier 0-20dB Output	May be remotely programmed over a 20dB range with a −1 to −10 volt signal (−10 volts corresponds to maximum output).
External FM	The full frequency range can be swept at rates up to 4 kHz. With reduced Deviation and Linearity, modulation rates to 100 kHz are possible.
External AM	External AM signals are applied to the same connections as for vernier 0-20dB control. Therefore, vernier range must be restricted so the −1 to −10 volt range is not exceeded or distortion will occur. With average voltage set to mid-range, 100% modulation is obtainable up to 1 kHz, 40% modulation is obtainable up to a 40kHz rate.

SWEEP SPECIFICATIONS

Sweep Modes	Repetitive sweep Single sweep Externally triggered sweep Manual sweep Line-lock sweep
Sweep Time	Continuously variable from less than 10ms to over 100 seconds, in 4-decade steps, plus vernier.
Horizontal Output	16 volts peak-to-peak (symmetrical about ground)

TABLE 1-1. Specifications (Con't.)

EXTERNAL LEVELING

External Monitor (ALC) — An external negative signal, between 0.2 and 2 volts, may be used to level the RF output. The ALC front panel input jack mates with Switchcraft type 750 plug.

MARKER SPECIFICATIONS

Type — Birdy by-pass marker system

Frequency

Marker Type	Model 2001A	Model 2001B
Harmonic	.2, 1, 5, 20 MHz	.2, 1, 30 MHz
Single Frequency	63.0 MHz	59.5, 1090.0 MHz
Sidebands (of single frequency markers)	±.35, ±.9 MHz	±4.5 MHz

Accuracy — .002% at 25°C, .005% from 0 to 50°C

External Marker Input — Rear Panel BNC connector accepts external CW signal for conversion to a Birdy marker. Input level: 100mV into 50 ohms.

Marker Width — Adjustable from (approx.) 15 to 400 kHz in four steps.

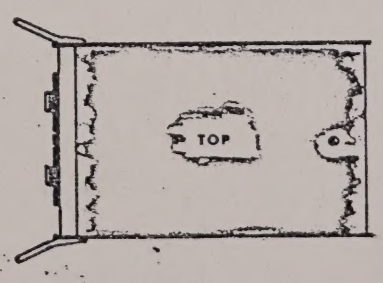
Marker Size — Adjustable from (approx.) 12V to 15mV peak-to-peak.

Rectified Birdy — Internal switch removes the negative portion of the birdy marker for use with X-Y recorders. Size varies with detector's impedance. Adjustable from (approx.) 6 volt to 1mV with detector impedance of 1 meg ohm, or from 0.5V to 1 mV with detector impedance of 0 ohms.

Marker Tilt — Provides horizontal markers with a size equal to approximately 10% of horizontal display. Adjustment of marker size vectorily adds the normal vertical marker to the horizontal marker, causing the resulting marker to vary from a horizontal position toward a vertical position.

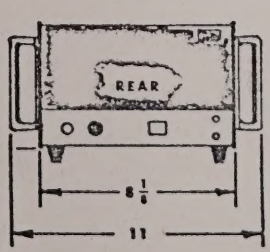
POWER REQUIREMENTS

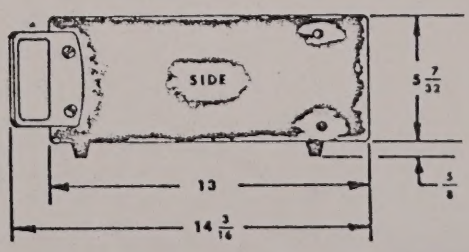
Line Supply — 115 or 230 VAC ± 10%, 50 to 60 Hz, (approx. 20 watts)



MECHANICAL SPECIFICATIONS

Weight
Net— 19 lbs.
Shipping—25 lbs.





1.3 OPTIONS

1.3.1 Penlift A-5, provides contact closure during sweep time.

1.4.1 Accessories furnished: Instruction Manual, external monitor model M151 and Plug to mate with Rear Panel REMOTE jack.

1.4.2 Accessories Available:

a. Wide band RF Detector	Model D-152 for 50 ohm applications up to 1400 MHz.
b. Service Kit	K102. Contains a module extender and extension cables.

SECTION 2
INSTALLATION

2.1 MECHANICAL INSTALLATION

2.1.1 Initial Inspection

After unpacking the instrument, visually inspect the external parts for damage to knobs, connectors, surface areas, etc. The shipping container and packing material should be saved in case it is necessary to reship the unit.

2.1.2 Damage Claims

If the instrument is received mechanically damaged in transit, notify the carrier and either the nearest Wavetek area representative or the factory in Indiana. Retain the shipping carton and packing material for the carrier's inspection.

The local representative, or the factory, will immediately arrange for either the replacement or repair of your instrument, without waiting for damage claim settlements.

2.1.3 Instrument Mounting

The instrument is designed for bench top mounting and is ready to operate as received.

2.2 ELECTRICAL INSTALLATION

2.2.1 Primary Power Requirements

These instruments operate from either 115 volt AC or 230 volt AC supply mains as selected by a Slide Switch located on the Rear Panel. Before operating the instrument, check that the fuse mounted in the Rear Panel Fuse Holder corresponds to the correct value for the selected voltage; i.e., 0.5 amp for a 115 volt AC, and 0.25 amp for 230 volt AC.

The power supply has been designed to operate from either 50 or 60 Hz supply mains, however, the WAIT control must be readjusted as described in Paragraph 5.4.6.

2.2.2 Performance Checks

The electrical performance of this instrument should be verified. Performance checks for incoming inspection are given in Paragraph 5.3.

SECTION 3
OPERATING INSTRUCTIONS

3.1 INTRODUCTION

This section provides complete functional control description, operating instructions, and programming instructions for the Sweep/Signal Generators.

In addition, special operating notes cover sweep rate errors, overloading, low level measurements and operation with networks analyzers and X-Y plotters.

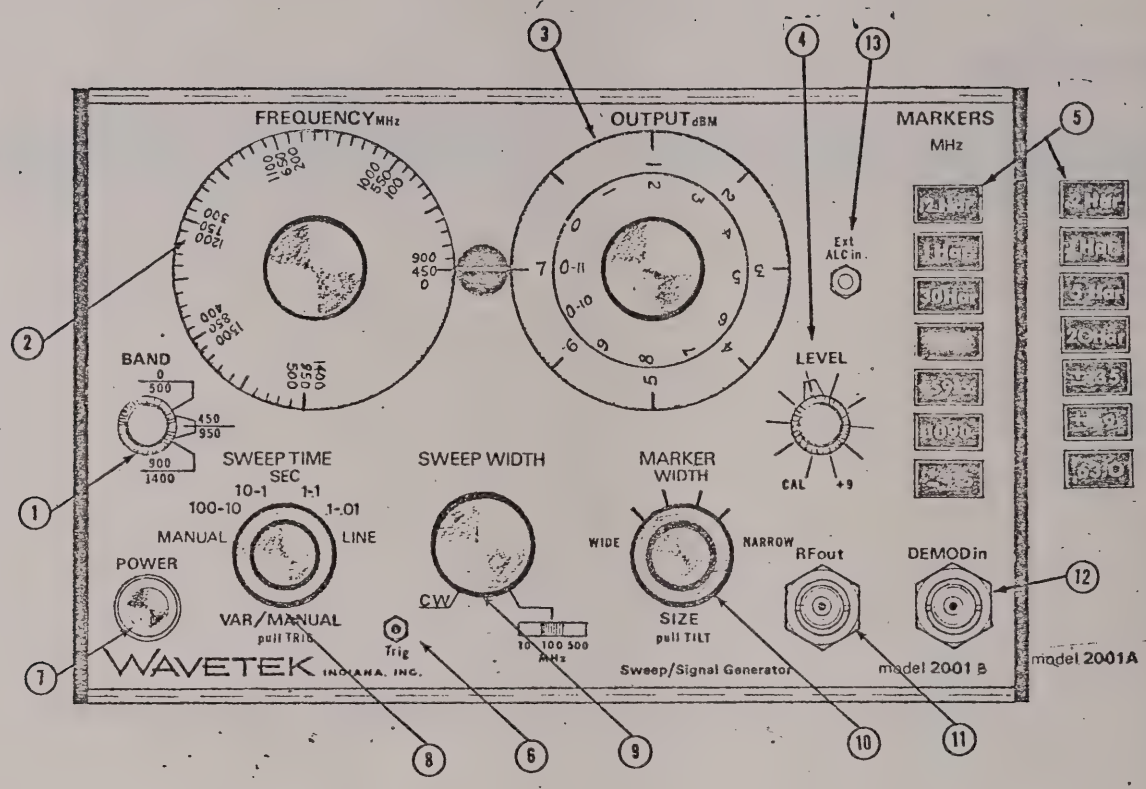


Figure 3-1. Front Panel

3.2 DESCRIPTION OF FRONT PANEL

(1) BAND Switch — Selects desired band; 1 to 500 MHz, 450 to 950 MHz or 900 to 1400 MHz.

(2) FREQUENCY — A dual concentric center frequency tuning control. The outer (coarse) knob calibrated in 10 MHz increments. The inner (vernier) knob provides approximately 5 MHz tuning range about the center frequency set by the coarse control.
NOTE: the coarse control will be on calibration when the calibration line of the vernier knob is aligned with the indicator line.

(3) OUTPUT dBm — Attenuator; Outer knob provides calibrated adjustment of the RF output in 10dB increments from 0dBm to −70dBm; inner knob provides calibrated adjustment of the RF output from 0dBm to −11dBm in 1dB increments (with the LEVEL control set to CAL)

(4) LEVEL CAL +9 — Attenuator provides vernier adjustment of the RF output from 0dBm to +9dBm.

(5) MARKERS MHz — Push buttons with the marker frequencies engraved on them turn on the corresponding single frequency or harmonic marker.

(6) TRIG	Momentary contact switch, triggers the sweep in the triggered mode for single sweep operation.
(7) POWER	Push button applies a.c. power to the power supply. The light indicates that the instrument is operating.
(8) SWEEP TIME Sec. VAR/MANUAL Control PULL TRIG	This is a six position Switch/Control. The Outer knob provides selection of MANUAL, LINE, or Four Decade Ranges of Variable sweep time. The Inner knob provides manual frequency sweeping when SWEEP TIME Sec. switch is set to MANUAL, and variable adjustment of sweep time in each of the four decade ranges. The sweep may be changed from recurring to triggered by pulling the knob out. (The sweep may be triggered in the four decade ranges only.)
(9) SWEEP WIDTH Control Switch	Logarithmically adjusts the displayed sweep width from less than 200 kHz to over 500 MHz when the slide switch is in the 500 MHz position. Switching to 100 or 10 MHz reduces the maximum sweep width as indicated. Full counter-clockwise rotation will switch the instrument to a continuous wave mode of operation.
(10) MARKER WIDTH SIZE PULL TILT	Dual concentric control; Outer knob adjusts marker width from 15 to 400 kHz in four steps; Inner knob controls marker size, and, when pulled out, activates the marker TILT feature. When the marker TILT is activated, full counter-clockwise rotation of the control will provide horizontal markers with an amplitude of approximately 10% of the total horizontal display. Clockwise rotation will produce a varying amount of tilt toward the vertical axis.
(11) RF OUTPUT	BNC connector provides a connection for the RF output signal.
(12) DEMOD INPUT	BNC connector accepts the demodulated swept signal from the device under test, so that RF markers may be added. (The combined signal is available at the SCOPE VERT connector on the rear panel).
(13) EXT. ALC in	Phone jack connector accepts an automatic leveling control signal from a remote monitor, and disconnects the internal ALC loop. (mates with Switchcraft type 750 plug)

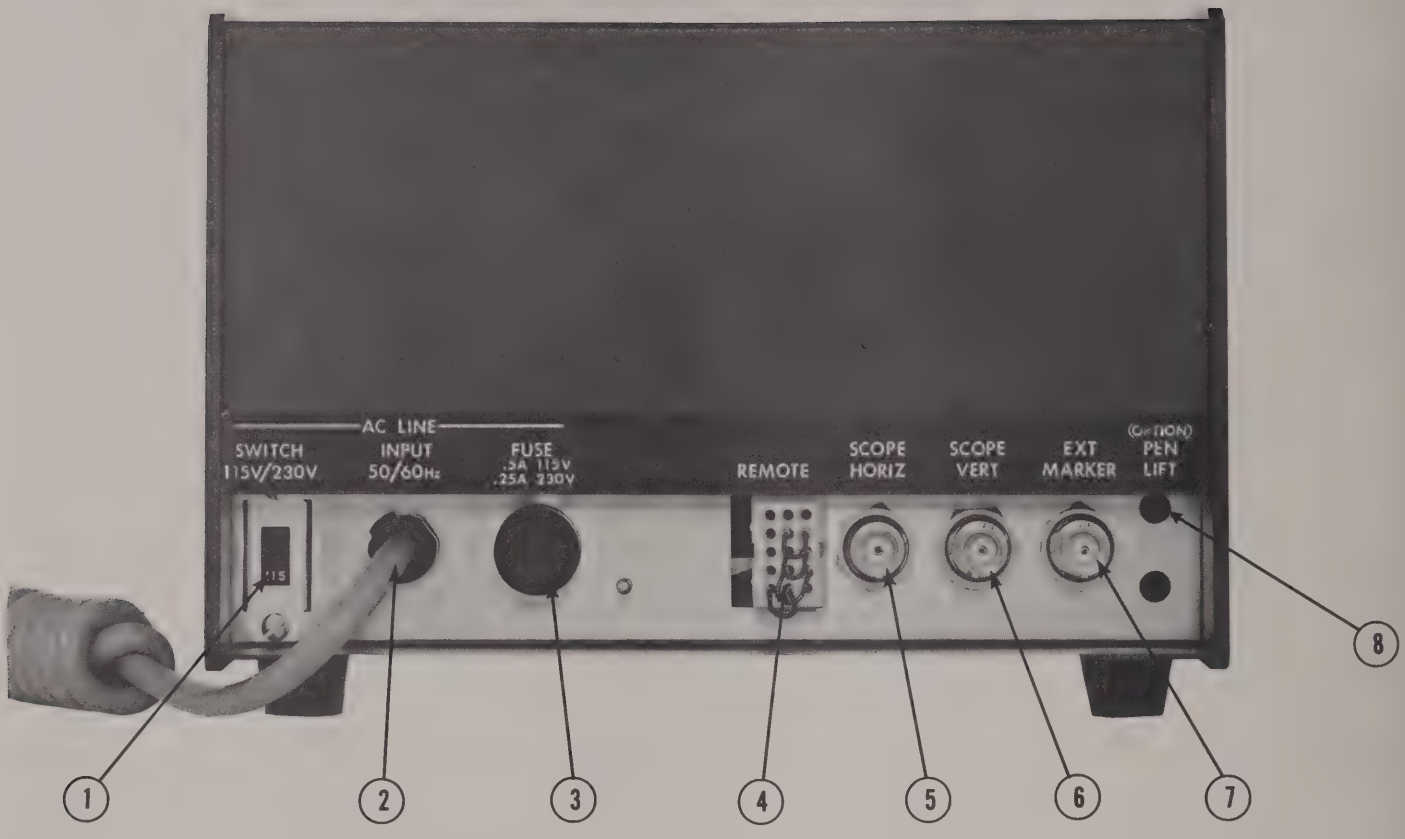


Figure 3-2. Rear Panel

3.3 DESCRIPTION OF REAR PANEL

① SWITCH 115/230 volt	Selects 115 or 230 volt line voltage.
② INPUT 50/60Hz	3 prong AC plug provides connection to AC mains.
③ AC LINE FUSE	0.5A for 115 volt AC or 0.25A for 230 volt AC.
④ REMOTE Jack	Provides connection for programming of frequency, sweep width and RF output level. (See paragraph 3-6 for detailed instructions). This jack is supplied with a mating "jumpered plug" which provides Front Panel control.
⑤ SCOPE HORIZ. Jack	BNC jack provides connection to (X) axis of oscilloscope or plotter.
⑥ SCOPE VERT. Jack	BNC connector provides the combined markers and demodulated RF (when Front Panel DEMOD INPUT is connected) for connection to the oscilloscope Vertical (Y) axis input.
⑦ EXT. MARKER Jack	BNC connector accepts an externally generated Continuous Wave signal to produce a frequency marker on the display.
⑧ (OPTION) PEN LIFT	When Pen Lift Option is installed, these 2 terminals provide *contact closure* during sweep "ON" time. This option operates only when the Front Panel SWEEP TIME Selector is set to the 100-10 SEC. position.

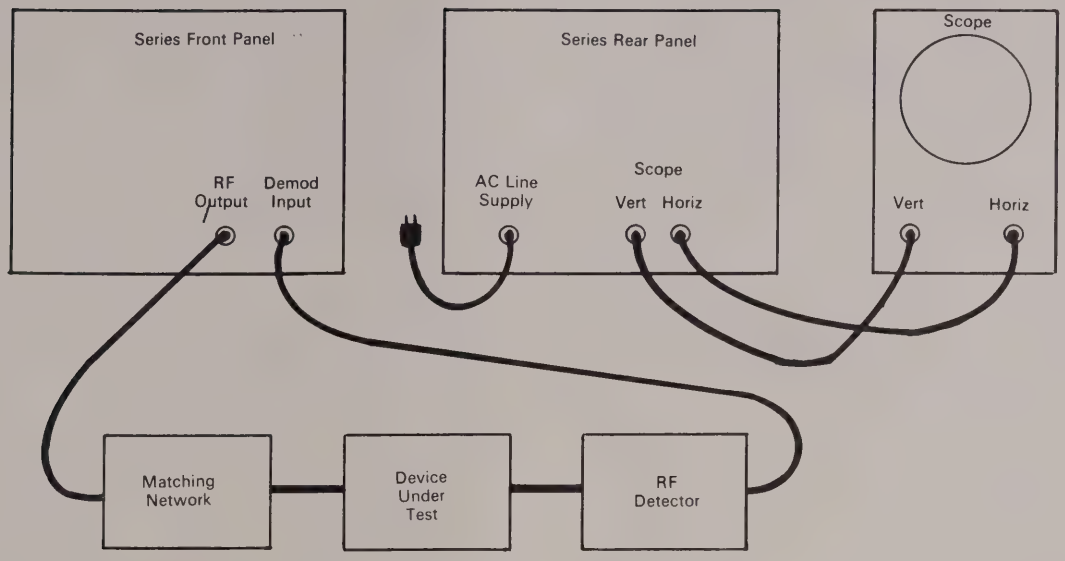


Figure 3-3. Typical Operating Set-up

3.4 TYPICAL OPERATING SET-UP

When initially setting up instrument, first check Rear Panel AC LINE VOLTAGE Selector Switch and Fuse to insure the instrument is set for operation with the available AC mains.

Make connections between the Sweep Generator, the device under test, and the oscilloscope as shown in Figure 3-3. Since Hum, RF leakage, and Spurious signal pick-up must be kept to a minimum, it is essential that good connections and grounds be maintained throughout the entire set-up. Use coaxial cables with BNC connectors wherever possible. The RF OUTPUT cable is especially critical. It should match the output impedance of the sweep generator and should be kept as short as practical (under 3 feet). If the input impedance of the device under test is not the same as the sweep generator output impedance, a matching network, as shown in Figure 3-3, should be used to insure a constant amplitude input signal to the device under test.

After the RF signal passes through the RF circuit, of the device under test, it must be demodulated before being connected to the DEMOD IN of the Sweep Generator. If a demodulator is not a part of the device under test, one must be added externally. (See Figure 3-3). The input impedance of the demodulator must present the proper load to the RF circuit being tested. The Wavetek Model D151 or D152 RF Detector is recommended for 50-ohm applications and the Model D171 for 75 ohm applications.

Depress the POWER push-button. The light in the switch button should light, indicating an operating condition.

(NOTE: This instrument does not require a warmup period unless it is to be used at the extreme limits of its specifications.)

After completing the set-up, adjust the Sweep Generator controls for the required Center Frequency, Sweep Width, Output Amplitude, and Sweep Rate. Turn the desired markers On, and adjust their Size and Width.

3.5 SPECIAL OPERATING NOTES

3.5.1 Errors From Sweep Rate Effects

When sweeping RF circuits having rapid amplitude changes, errors may occur, due mainly to detector delays. Decreasing the detector output time constant will minimize this effect. Figure 3-4 illustrates sweep rate effect.

To check for sweep rate effect, first set the sweep width to its lowest practical amount, then reduce sweep time while closely observing the swept output response. Any change in the response indicates the sweep rate is too fast for a true response. When a further reduction of sweep time does not change the response, a true response has been obtained.

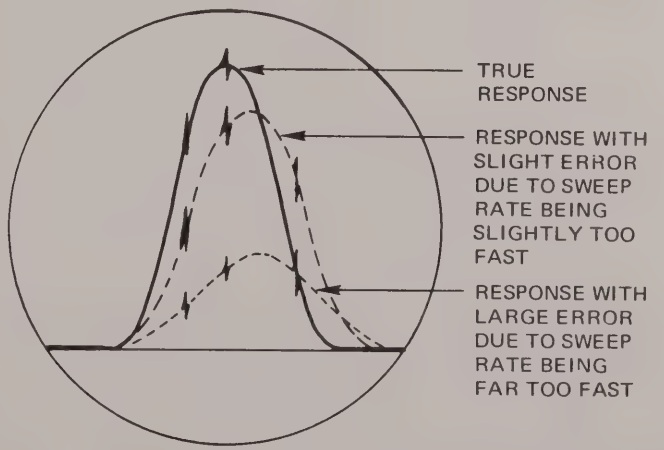

TRUE RESPONSE
RESPONSE WITH SLIGHT ERROR DUE TO SWEEP RATE BEING SLIGHTLY TOO FAST
RESPONSE WITH LARGE ERROR DUE TO SWEEP RATE BEING FAR TOO FAST

Figure 3-4. Sweep Rate Effects

3.5.2 Effects From Overloading

The use of excessive input signals to the device under test can cause overloading. To assure that this condition is not present, and that the response is a true representation of the device under test, turn the OUTPUT dbm controls to minimum output amplitude. Gradually increase the output amplitude until a response is obtained. Further increase of the output amplitude should not change the configuration of the response envelope except in amplitude. If the response envelope does change, such as flattening at the top, decrease the output just far enough to restore the proper configuration.

3.5.3 Making Measurements At Low Levels

When making measurements at low levels, radiation and ground loops become problems. Using double shielded cables for cables carrying RF signals helps minimize the radiation problem. Ground loops causing hum pick-up can sometimes be eliminated by completing only one ground connection between each instrument. This applies particularly to the scope horizontal input. If the ground connection is made at the vertical input terminal, an additional ground at the horizontal input terminal will often result in hum pick-up.

3.5.4 Operation With X-Y Plotters

Two features are incorporated into the Sweep Generator to facilitate operation with X-Y plotters. First, a Marker Clamp Switch converts the hi-frequency marker signals to a lower frequency which is compatible with the operating speed of the plotter pen. This is an internally operated switch located directly behind the front panel DEMOD input jack, and is accessible by removing the instrument bottom cover.

Second, is an optional feature (A-5). This feature provides a Contact Closure during the sweep time, to operate the plotter's Pen Lift. The A-5 feature operates only when the Sweep Time selector switch is set to its slowest position, 10 to 100 sec.

3.5.5 Operation With Network Analyzers

To operate properly with certain network analyzers several modifications might be required. Some analyzers require the removal of the blanking signal during the sweep return trace. This can be accomplished by disconnecting the single wire connected to pin 10 of the M1H Module. Another modification sometimes required is to provide a horizontal output ramp that varies from zero to some positive voltage instead of the standard −8 to +8 volt ramp. This can be accomplished by connecting a 56 K ohm resistor between pins 2 and 11 of the M1H Module. This connection provides a horizontal output signal from approximately 0 to 11 volts.

3.5.6 Operation With An External Monitor

Operation with an External Monitor can produce a flatter (less amplitude variation) input signal, to the device under test, than is obtainable with the internal monitor. The external monitor point is located at the point where greatest flatness is desired, and is not affected by cable VSWR or input impedance of the device under test. Another application, is to level at the output point of a Wide Band Power Amplifier, in order to increase the output power capability of the sweep generator.

To operate with an external monitor; First, set the OUTPUT controls for maximum. Next, connect the output from the External Monitor to the Front Panel phone jack labeled ALC IN. The signal from the external monitor must be of a negative polarity between 0.2 and 2 volts. If the signal is larger than 2 volts, use a resistive divider to obtain. less than 2 volts, While observing the output from the monitor on an oscilloscope, adjust the Vernier OUTPUT Control until the monitor signal becomes leveled. (Refer to Figure 3-5).

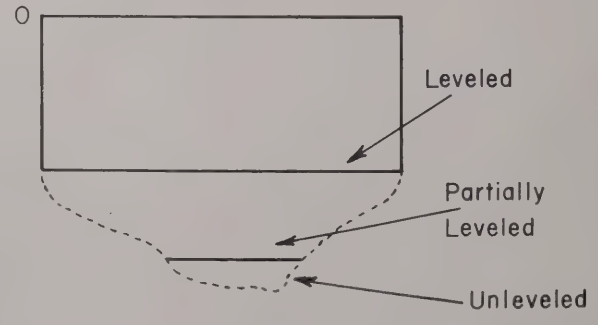
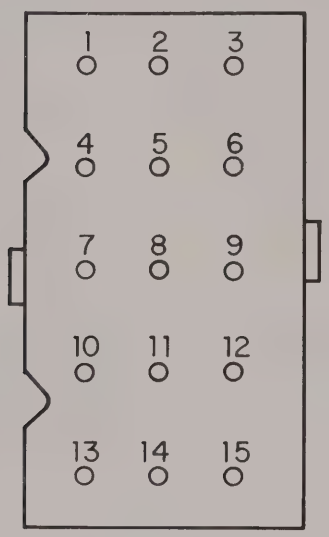


Figure 3-5.

3.6 PROGRAMMING

Connections for remote operation of OUTPUT AMPLITUDE, FREQUENCY and SWEEP WIDTH plus EXTERNAL AM and FM MODULATION and triggering of the sweep circuit is provided by a Rear Panel REMOTE programming connector. The programming jack and its pin functions are shown below.



Rear Panel
Remote Jack J 101

VOLTAGE AND SIGNAL SOURCES

Pin 1—Ground
Pin 2—+16 volts
Pin 3—−16 volts
Pin 4—−18 volts
Pin 10—Ramp for Driving Sweep Width Control

CONTROL INPUTS

Pin 6—Output Level Control (AM Modulation)
Pin 7—Sweep Time, Trigger Input
Pin 9—Frequency Control
Pin 12—Sweep Width Control (FM Modulation)

INTERNAL CONTROL

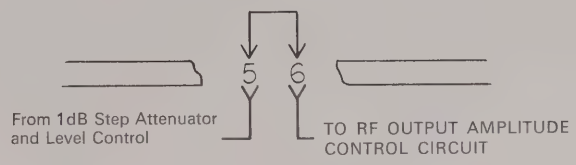
Pins 5, 8, and 11 are used to program internal operation of Output, Frequency and Sweep Width.

UNUSED

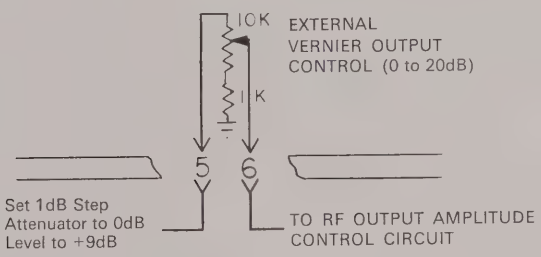
Pins 13, 14 and 15 are unused.

3.6.1 OUTPUT AMPLITUDE CONTROL (AM MODULATION)

Normal internal control is provided by a jumper wire connected between pins 5 and 6 of the REMOTE plug as shown below.



To provide external control, remove jumper wire and connect an external OUTPUT Control as shown below. The RF OUTPUT is a linear function of the programming voltage as shown in Figure 3-6.



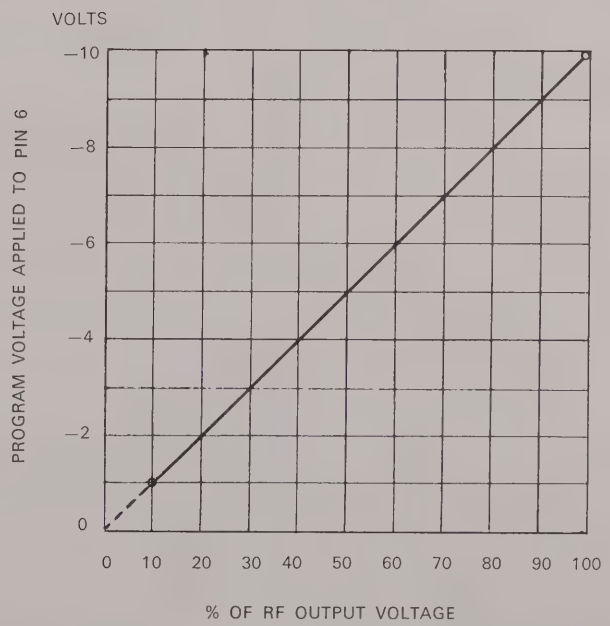
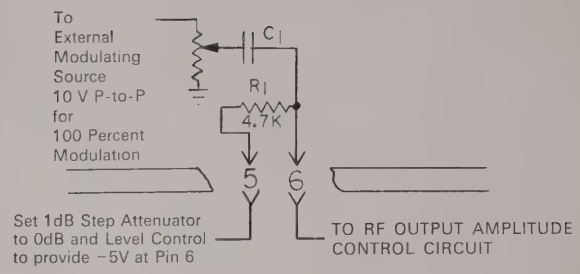


Figure 3-6. Program Voltage/RF Output

To provide AM MODULATION, connect as shown at right. The low frequency modulation will be limited by the reactance of capacitor C1. Lower frequency modulation, down to DC, can be provided with a modulating source having a DC offset. In this case, the modulating source is connected directly to Pin 6 and no connection is made to Pin 5. In all cases, the peak modulating voltage plus the DC offset must be within the limits of 0 to −10 volts, as shown in Figure 3-6, or distortion will occur. The modulation frequency limits the maximum usable percentage of modulation as shown in Figure 3-7. This graph was obtained with the DC level set to −5 volts.



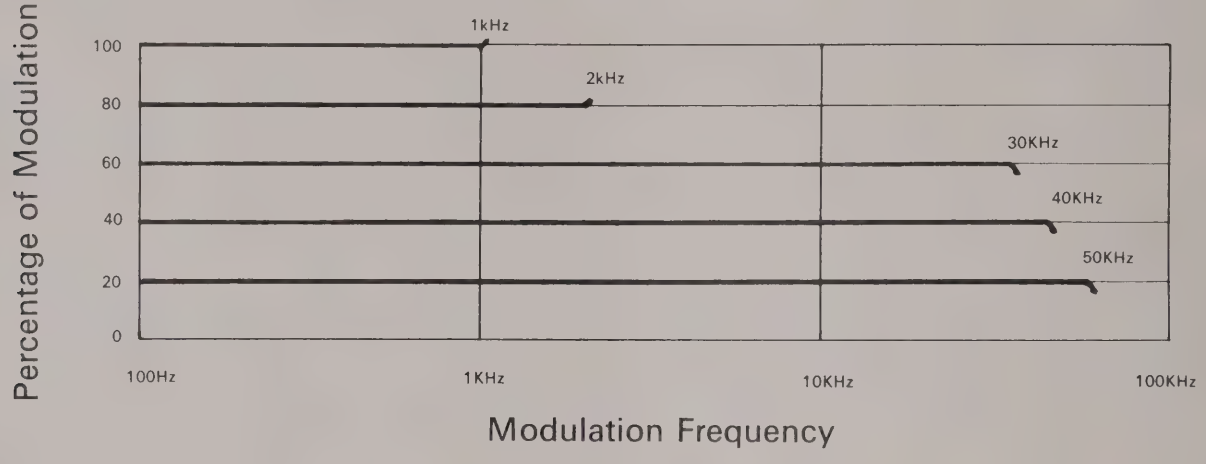
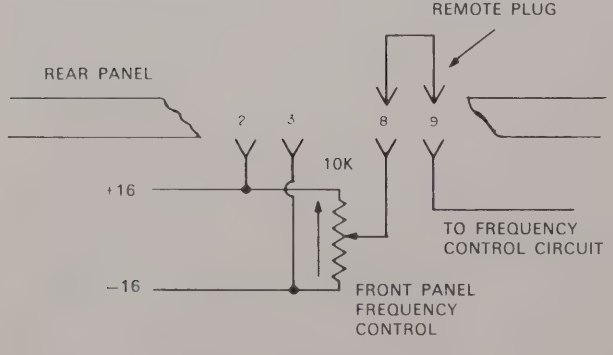


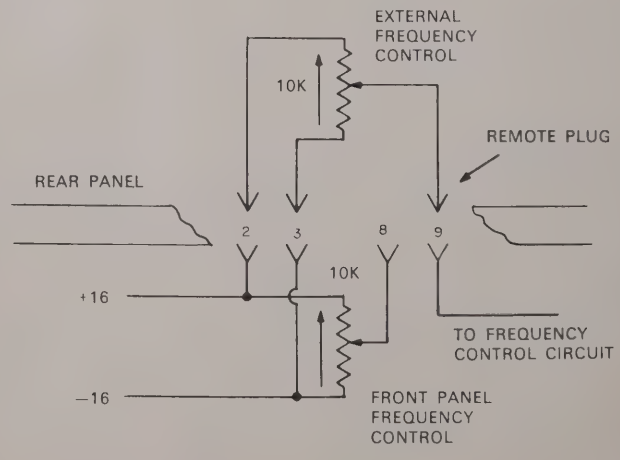
Figure 3-7. Percentage Modulation/Modulating Frequency

3.6.2 FREQUENCY CONTROL

Normal internal control of frequency is provided by a jumper wire connected between pins 9 and 8 of the REMOTE plug as shown below.

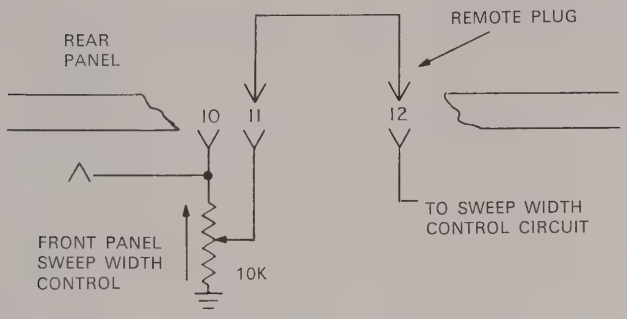


To provide external control, remove the jumper and connect pin 9 to an external Frequency control as shown below. Tuning sensitivity, is shown graphically in Figure 3-8.

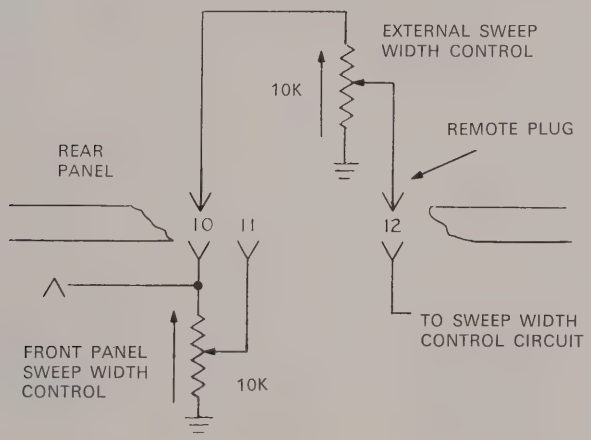


3.6.3 SWEEP WIDTH CONTROL (FM Modulation)

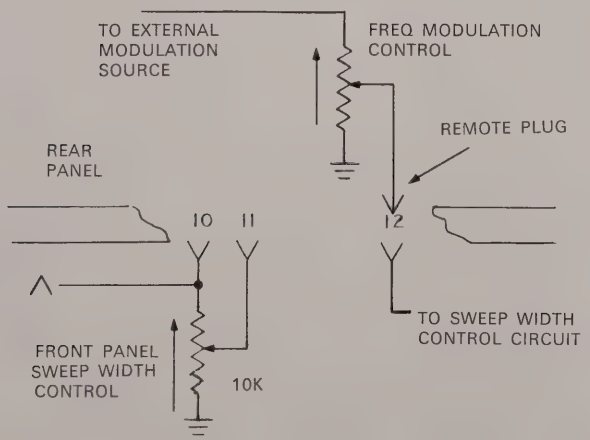
Normal internal control of Sweep Width is provided by a jumper wire from pins 11 to 12 of the REMOTE plug as shown below.



To provide external control, remove the jumpers and connect pin 12 and 14 to an external Sweep Width control as shown below.

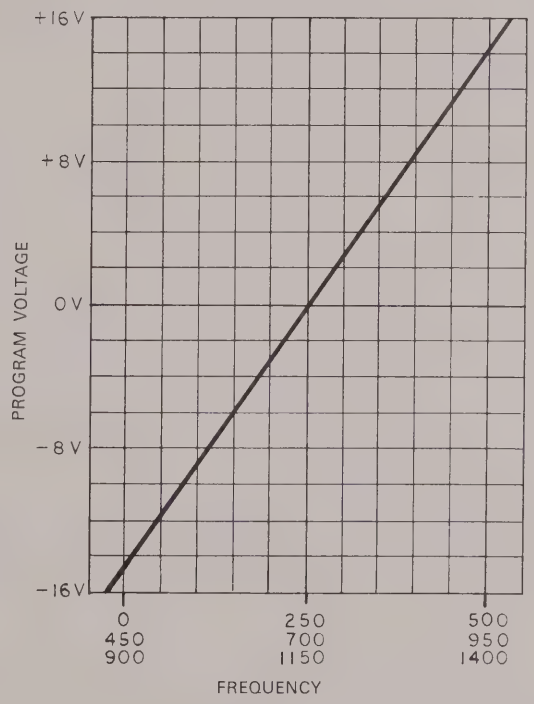


To provide FM modulation, connect as shown below and set the Sweep Width Control for CW operation.



The modulating wave form should have an average potential of zero volts. Frequency sensitivity, is shown graphically in Figure 3-8. The maximum modulating frequency, while still maintaining this sensitivity, varies from approximately 4 kHz at maximum deviation to 20 kHz for 1 MHz deviation. (See Figure 3-9). With decreased frequency sensitivity, frequency up to 200 kHz can be used, as shown in the shaded area of Figure 3-9.

The peak amplitude of the modulating signal plus the DC voltage supplied to the Frequency Control (pin 9 of REMOTE plug) should not exceed + or −16 volts. This amplitude would program the unit to sweep beyond the band limits.



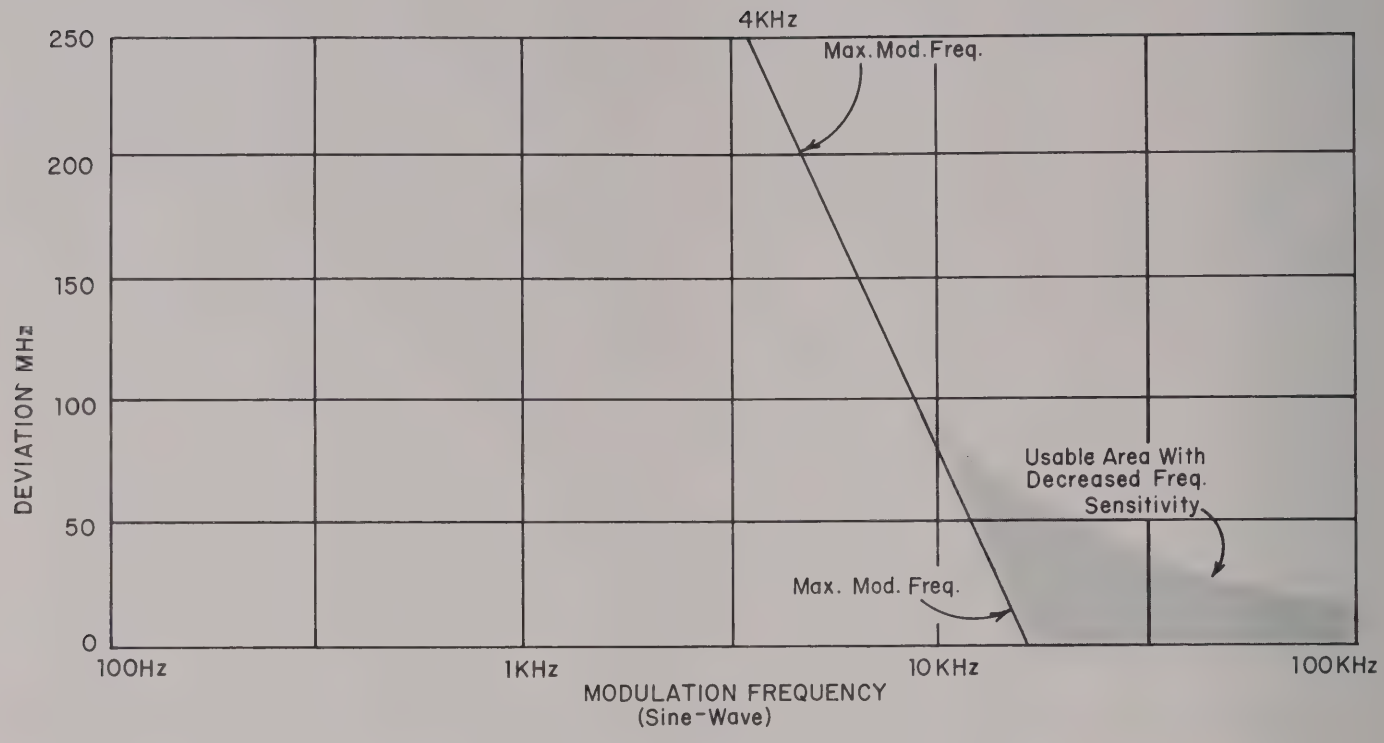


Figure 3-9. FM Modulation Frequency Limits

3.6.4 REMOTE TRIGGERING OF SWEEP TIME CIRCUIT

The Sweep Time Circuit can be remotely triggered by applying a 10 volt positive pulse to pin 7 of the REMOTE plug. For proper operation, the Front Panel SWEEP TIME Selector must be set for one of the four variable sweep time positions, and the PULL/TRIG Switch set to its IN position. The repetition rate of the external trigger should be slower than the free running rate set by the Front Panel SWEEP TIME Selector and VAR/MANUAL Control.

SECTION 4
CIRCUIT DESCRIPTION

4.1 INTRODUCTION

This section first presents an overall block diagram analysis followed by a more detailed description of each module.

Before beginning the actual circuit description, it would be well to consider the mechanical arrangement of the instrument. This will enable the following block diagram and circuit description to be associated with its physical position, thereby, providing a better understanding of the overall instrument. The mechanical arrangement can be seen by referring to Figure 5-14 in the Maintenance section. This TOP VIEW shows the Front Panel, plug-in module and the rear chassis Power Supply sections.

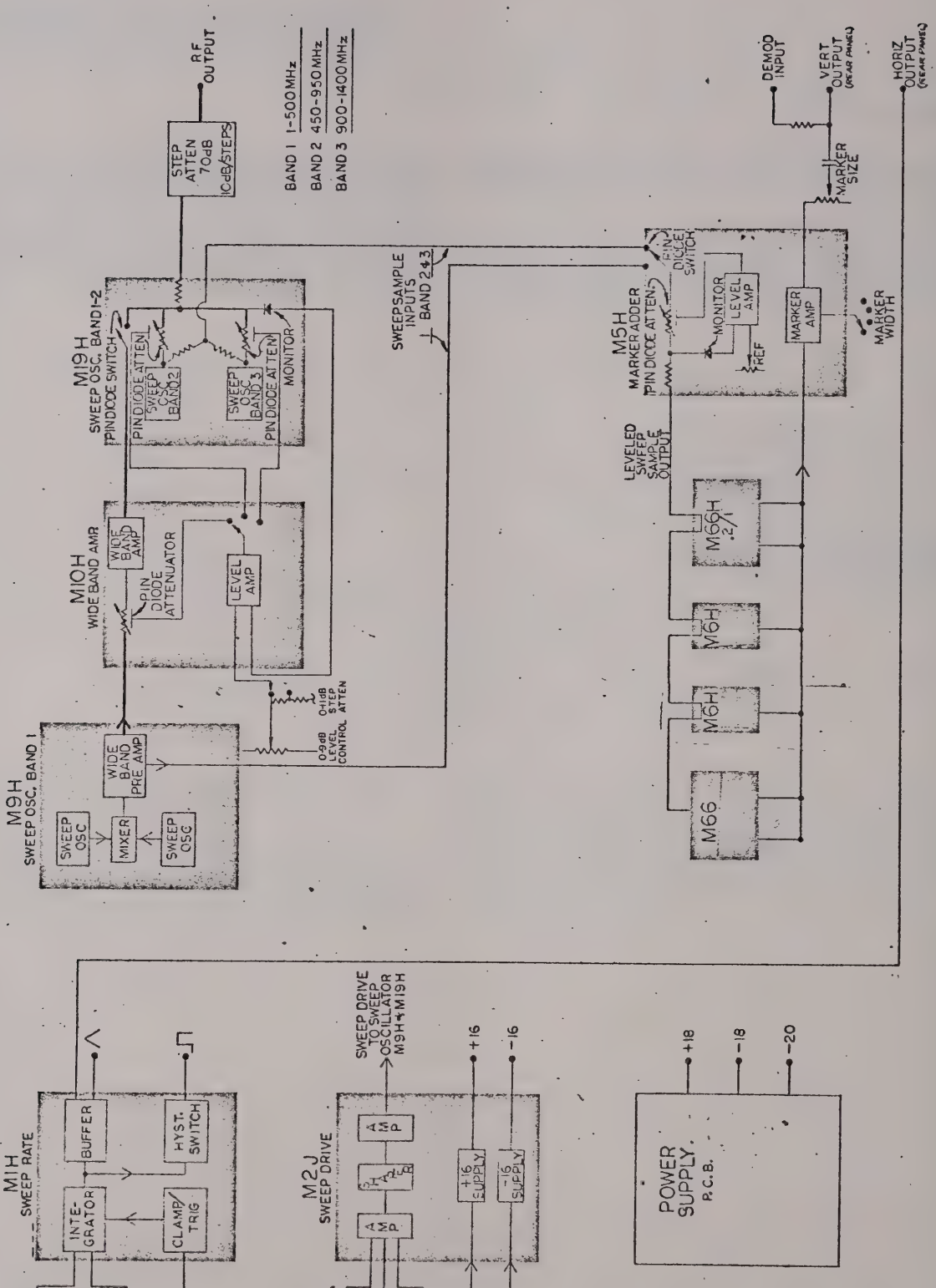


Figure 4-1. Simplified Block Diagram

4.2 SIMPLIFIED BLOCK DIAGRAM

The block diagram in Figure 4-1 contains both block and module information. The blocks contained within each module are indicated by the module outline.

The Power Supply provides three regulated voltage sources of +18, -18, and -20 volts for connections to the plug-in modules.

The M1H module generates the sweep ramp, blanking and scope horizontal voltages.

The M2J module contains three distinct circuits; a -15 volt reference supply, a +16 volt reference supply, and the sweep drive circuits.

The two reference supplies and the sweep ramp voltage provide the signals to the Front Panel frequency and sweep width controls. The signal from these controls is then fed to the sweep drive circuit in the module, where they are combined into a single signal, which drives the frequency determining varactor diodes in the sweep oscillator modules. Necessary level shifting, shaping and amplitude control is provided by the sweep drive circuit.

The RF signal for BAND 1 (1 to 500 MHz) is generated in the M9H module where the signal from two sweep oscillators are combined in a diode mixer. The resultant, difference signal, is fed to a 1-500 MHz pre-amplifier and then to the M10H module. This module contains a voltage variable attenuator and the final 1-500 MHz amplifier. The output from this amplifier is then fed to the M19H module where a PIN diode switch completes the circuit to the RF output circuit.

Leveling of the RF output is accomplished by a monitor diode which measures the RF voltage and compares it to a reference voltage supply by the vernier output control. Any error between the two voltages is amplified in the leveler amplifier located in the M10H module. The error voltage is then connected to the voltage variable attenuator at the input of the final 1 to 500 MHz amplifier. This closed loop system maintains a constant amplitude RF signal at the monitor point, which compensates for amplitude variation in the sweep oscillator, mixer, and amplifier circuit and also creates a zero impedance at the monitor point. In order to create a 50 ohm source impedance, a 50 ohm resistor is connected between the zero impedance point and the RF output system.

The sweep oscillators for bands 2 & 3 are located in the M19H module. The RF output from the oscillators is fed through voltage variable attenuators directly to the RF output circuit without amplification. Leveling for bands 2 & 3 is accomplished in the same manner as for band 1.

The marker circuit is comprised of the marker adder module M5H, and the individual marker generators M6's. In addition to the marker adding function of the M5H module, it also provides for selection and leveling of the sweep sample signal in the same manner as the main RF output signal was leveled. This provides a constant amplitude sweep sample signal to the individual marker modules which is extremely important to obtain a "flat comb" output from the harmonic generating marker modules. It also standardizes the sweep sample amplitude in all instruments, which insures proper operation of field installed markers.

This constant amplitude sweep sample signal is then fed to the individual M6 marker modules where it is combined in a mixer with a crystal controlled CW signal. The resultant different signal, which is the birdy marker, is then fed back to the marker adder module where they are combined, amplified, and shaped into a single composite signal. This signal is then fed through the marker size control and to the Rear Panel vertical output connector.

The following circuit descriptions are referenced to the schematics appearing in Section 6.

4.3 POWER SUPPLY (PS6)

The PS6 power supply provides three regulated voltages and an optional "pen-lift" circuit.

AC POWER & RECTIFIER CIRCUITS

A dual-primary transformer allows operation at a line voltage of 115 or 230 volts. AC power is supplied through a 4 wire receptacle from the Front Panel ON/OFF switch. The transformer is located away from the sweep drive module to reduce magnetically coupled line ripple. Unregulated plus and minus voltages are supplied by two full wave rectifier circuits and filtered by C1 and C7. A 12 pin plug, mounted to the printed circuit board, provides access to three unregulated voltages as well as the regulated +18 -18, and -20V. This plug also accepts a scope horizontal signal for connection to a Rear Panel connector. The pen-lift switching circuit is also enabled through this plug.

PEN LIFT OPTION

Installation of K50 and Rear Panel jacks provides a contact closure which occurs during the sweep on-time. Q11 is normally conducting from current supplied through pin 9 of the 12 pin plug. When the base drive to Q11 is removed, the relay is energized by the turn-on of Q12. To prevent early failure of the relay contacts, the relay is only energized during slow sweep speeds and in the manual position of the front panel sweep rate selector.

+18 VOLT SERIES REGULATOR

Regulation is provided by IC1 which contains its own internal reference supply. R9 provides an adjustment to +18.00 volts. An external pass transistor, Q2, boosts the current capability, and Q1 improves the current limiting characteristics of IC1 by providing amplification before limiting. The +18 volt supply is protected against reverse voltage by CR7.

-18 VOLT SERIES - SHUNT REGULATOR

The voltage reference for this supply is obtained from the +18 volt supply through R20, and R19 provides the feedback which is applied to IC2 which provides high gain forcing Q5 to maintain a shunt regulated voltage across R13. Q3 and Q4 provide the series pass element and are connected as a compound emitter follower so that the voltage across R13 is not loaded heavily. Short circuit protection of Q5 is provided by CR8. Current limiting is provided by Q5, when Q6 conducts sufficiently to forward bias CR9 and CR10. Reverse voltage protection is provided by CR12.

-20 VOLT SERIES REGULATOR

The reference voltage for the -20V supply is applied to a differential amplifier, Q9 and Q10, which in conjunction with Q8 provides a compound emitter following action similar to the pass element of the -18V supply.

CR 17 provides reverse voltage protection. Current limiting is provided by shutting down of the -18 volt supply by Q7 through CR14 to the base of Q5, reducing the reference voltage to the base of Q9. This action is helped along by the conduction of CR13 if the -20 volt supply drops below -18 volts.

4.4 SWEEP RATE (MODULE M1H)

M1H SWEEP RATE GENERATOR

This module generates a variable rate square and triangular waveform. Front Panel switching provides recurring, triggered, or manual modes. The triangular waveform is a 32 volt peak-to-peak signal with a sweep time variable from 10ms to 100 seconds in four steps. Retrace time is held constant at the fastest sweep time of each range. The triangular waveform is used to provide the sweep drive and the scope horizontal signals.

The square wave output is a -1 to +15 volt signal whose -1 volt level corresponds to the sweep time and whose 15 volt level corresponds to the retrace time. The square wave is used to provide blanking of the RF output during retrace time.

Triangular waveforms are generated in an integrator, Q1, Q2, Q3, and Q4, by applying positive and negative voltage levels to the integrator input. When the integrator positive ramp output exceeds a threshold voltage, a bi-stable hysteresis switch is switched, reversing the polarity of the integrator dc input, causing the triangular waveform to start down toward another threshold. If the module is programmed in a recurring mode, the negative ramp will trip the hysteresis switch producing continuous oscillations. The hysteresis switch output is clipped on the negative polarity and is used for blanking (pin 10).

The symmetrical square wave output from the hysteresis switch (pin 9) is connected, through the Front Panel SWEEP TIME vernier and one of the range determining resistors of the SWEEP TIME selector switch, to the integrator input (pin 7). Since the integrator output voltage change is proportional to the input voltage level, the SWEEP TIME vernier provides a sweep time increase by reducing the hysteresis switch output if the polarity is negative. If the polarity is

positive, full output is retained (a diode opens the vernier ground connection) producing a nearly constant retrace time.

For triggered modes, the negative threshold of the hysteresis switch is shifted out of the way by a diode and resistor connected through Q14 or through S102D, when in "line" position. The integrator will now continue its negative ramp until it is stopped by a clamp circuit turned on by a comparator. The integrator output is now held at this level unless a trigger is applied to the hysteresis switch. A trigger cannot flip the hysteresis switch until this clamp level is reached because the triggers must pass through an amplifier which is gated off until the clamp comparator (Q9) conducts.

Triggers are prevented from reaching the hysteresis switch (pin 6) by a voltage at pin 1, which causes comparator Q8 to open FET switch Q14. The primary function of the voltage at pin 1 is to shift the clamp comparator input out of the way to allow free-running oscillations.

Since the integrator is an inverting amplifier, and both input (pin 7) and output (pin 8) are available, a feedback resistor network allows the SWEEP TIME vernier, R102, to be used as a dc level shifter in the manual mode. A non-inverting amplifier consisting of Q6, Q7 and Q19, with a gain of 2, provide a 32 volt peak-to-peak wave output which is used for sweep drive. This output is divided by R18 and R53 to provide a horizontal drive of about 16 volts peak-to-peak at an impedance of about 23K ohms.

A centering adjustment (R41) provides a dc level adjustment of the integrator and horizontal outputs (pin 8, pin 12, and pin 11) by shifting both positive and negative thresholds of the hysteresis switch. A size adjustment (R45) provides an amplitude adjustment by effectively varying the size of the hysteresis window. Symmetry of trace and retrace time (for equal positive and negative input voltages to the integrator) is established by adjusting the integrator balance control R7. This adjustment also affects the manual mode centering and the sweep period for fully counterclockwise rotation of the SWEEP TIME vernier.

The four sections of the SWEEP TIME selector switch program the M1A module. The functions of each section are listed below:

Section A	Integrator input selector
Section B	Clamp level shift and routing switch disconnect
Section C	Trigger source selector
Section D	Line trigger routing, and hysteresis switch hold.

Circuit operation as modified by the switch positions may be understood by considering the MANUAL, VARIABLE RATE, and LINE positions one at a time.

MANUAL POSITION

Section A. A feedback resistor R113 is connected from output (pin 8) to input (pin 7) of the integrating amplifier, converting it to an inverting dc amplifier. Resistor R114 shifts the amplifier output dc level to -8 volts for zero input voltage to R104. When the SWEEP TIME vernier control R102 is fully clockwise, the negative input voltage to R104 is sufficient to shift the output voltage to +8 volts dc.

Section B. The clamp is disabled in this position by applying +18V to pin 1, causing the hysteresis switch input to be disconnected from any internal source of triggers by opening the routing switch Q14 (since Q8 is turned off). The shift bias is disconnected when Q14 is open.

Section C. The trigger input point pin 4 is grounded.

Section D. The hysteresis switch is held in one state by applying -18 volts to its input through a 33K ohm resistor. This causes the output to be negative (this bistable circuit is a positive feedback amplifier) providing the proper polarity to R102 and preventing blanking of the RF output.

VARIABLE RATE POSITIONS

Section A. Proper integrator input resistors are selected in decade increments in these positions, R105 - R108.

Section B. The clamp is disabled and triggers are held off unless the "pull trigger" switch is opened, removing +18 volts.

Section C. Two trigger sources are connected to pin 4; an external trigger from REMOTE jack J101-7 and triggers from the Front Panel momentary TRIG switch S103.

Section D. No connection is made to pin 6 in any of the four variable rate positions.

LINE POSITION

Section A. The proper value integrating resistor is selected, by-passing the SWEEP TIME vernier, to produce equal sweep and retrace periods.

Section B. Clamping, works in this position independently of the "pull trig" switch.

Section C. The line rate square wave from the power supply is connected to the trigger input.

Section D. Amplified triggers are routed into the hysteresis switch independently of the internal routing transistor, providing additional (redundant) line rate reliability.

4.5 SWEEP DRIVE (MODULE M2J)

The M2J module provides the correct sweep drive voltage required by each oscillator as programmed by the Front Panel Tuning controls, Sweep Width controls, and the band switch.

These programs are summed to a standard voltage level and then feed shaping circuits for each band which are enabled by the B-1 B-2 and B-3 voltages

The shaping diodes conduct at levels determined by a resistor network driven by a constant current source, Q4. As each diode conducts, an additional current is fed into the summing junction of the output amplifier consisting of Q8, Q9, and Q10.

The output waveform amplitude is controlled by R42, R44, and R46 which are connected by switch transistors Q11, Q12, and Q13 into the feedback path to the summing junction.

This module also provides two regulated voltages for use primarily as programming voltages.

4.6 SWEEP OSCILLATOR, BAND 1 (MODULE M9H)

The RF sweep signal for band 1 is developed by the hetrodyne method which utilizes two UHF sweep oscillators, a diode mixer, and a wide-band RF amplifier.

Sweep oscillator, Q2, sweeps from approximately 1.4 to 1.65 GHz. The average frequency is adjusted by R2 which controls the average bias on the varactor diodes, CR1, CR2, and CR3. The sweep drive voltage from pin 9 of the module is connected to the opposite side of these diodes causing the frequency to vary above and below this average frequency in a low-to-high frequency direction.

Sweep oscillator, Q5, is similar to the Q2 circuit, however, the varactor diodes have been reversed, and the polarity of the bias voltage supplied by R12, course adjustment, and R13, CENT FINE adjustment, has been changed. These changes cause the oscillator frequency to vary from a high to low frequency. The approximate output frequency is 1.4 and 1.15 GHz. This out of phase sweep technique has several advantages. First, larger sweep widths are obtainable and second, the nonlinearity (FREQ versus TIME) of one oscillator is cancelled by the nonlinearity of the second oscillator. R9, which is a linearity adjustment, optimizes this cancelling process by controlling the sweep drive ratio between the oscillators.

The two sweep signals are combined in a single balance diode mixer comprised of L4, L5, CR8 and CR9. The resultant, difference frequency, of 0 to 500 MHz, is then amplified in the wide band amplifier consisting of transistor stages Q11, Q12, and Q13.

Transistor stages Q6 and Q7 supply the blanking voltage to the wide band amplifier and causes it to be shut off during the sweep retrace time. The output from the wide band amplifier is connected to J1, which in turn is connected to the output wide band amplifier located in module M10H. A second output is also obtained from this amplifier and is coupled, via R45, to a similar wide band amplifier consisting of transistor stages Q14, Q15, and Q16. The output from this amplifier is connected to J2 which in turn is connected to the marker generating circuits.

Transistors Q8, Q9, and Q10 provide a -15 volt supply to operate the sweep oscillators. This improves stability and provides isolation between the oscillators and the -18 volt supply.

4.7 OUTPUT AMPLIFIER, BAND 1 (MODULE M10H)

The M10H module contains a wide band amplifier, an electronic attenuator, and a leveler amplifier.

WIDE BAND AMPLIFIER

This amplifier provides 2 stages of RF amplification to increase the RF input level present at Q1 by about 40dB.

The frequency response of this amplifier is reduced for frequencies near 0.5 MHz or lower and above 500 MHz.

The input amplifier stage consisting of Q1, Q2, and Q3 is enabled by the B+1 switching voltage, and the output stage, consisting of Q4, Q5, and Q6 by the -20 voltage, when the Front Panel band switch is in the Band 1 position. The -20 voltage also provides current through R30 and the RF out-

put cable to turn on a pin diode, located in the M19H module, which couples the band 1 RF output into the RF output system.

ELECTRONIC ATTENUATOR

Ahead of the first RF amplifier is an electronic attenuator consisting of PIN diodes, CR1, CR2, and CR3 which provides variable RF conductance proportional to the positive current supplied through the switching transistor Q7.

LEVELER OUTPUT (PIN 6)

The leveler amplifier (Q9, Q10, and Q11) provides leveling of the RF output for Bands 1, 2 and 3 by supplying a positive current to the electronic attenuator system for each band as directed by the band switching voltages (B-1, B-2, and B-3) which turn on the correct switching transistor for that band (in the M10H module or the M19H module).

A positively increasing output voltage from the leveler amplifier will increase the RF output level. RF blanking is effected by a positive input voltage (pin 4) to switching transistor Q8 which causes the leveler output (pin 6) to go negative during sweep retrace time shutting off the electronic attenuator.

LEVELER INPUTS (Pin 5 and Pin 7)

A monitor diode, located external to the M10H, provides a negative DC voltage related to the RF output level present in the output system. The output system and monitor diode is located in the M19H module or in an external monitor circuit. This negative voltage is connected to one input of the operational amplifier, consisting of Q9, Q10, and Q11.

Since an increasingly negative voltage at the input will reduce the positive current supplied to each electronic attenuator, the RF output level is held constant, by negative feedback, at a level determined by a reference voltage. This reference voltage varies under control of the LEVEL PROGRAM input voltage at pin 7 of the M10H module. The magnitude of this negative voltage is determined by the MAX pot which sets the maximum RF level when the program voltage is maximum (-10 volts). The MIN pot provides a small negative reference voltage which determines the minimum RF level when the level program voltage at pin 7 is -1 volt.

4.8 SWEEP OSCILLATOR, BANDS 2 & 3 (MODULE M19H)

This module contains two separate sweep oscillators, each with its voltage variable attenuator and the necessary switching circuitry to connect either band 1, band 2, or band 3 to the common monitor and RF output connector.

Band 1 is connected to the RF output circuit by PIN diode CR9. The control current for switching this diode is contained in the M10H module.

Band 2 oscillator, consisting of Q6 and its associated circuitry, is a common base oscillator varactor-tuned by CR2, CR3, CR4 and CR5. Biasing of the varactor diodes is provided by Q1 and Q2. Q3 is a switching transistor which disconnects the bias voltage from the varactors when the unit is operated on band 1 or band 3. The B -voltage for the oscillator is modulated by the blanking signal, from pin 4, in transistor stages Q4 and Q5. This modulation causes the oscillator to be cut off during the sweep retrace period, thereby providing a zero RF output level during the retrace time. The RF signal is coupled from the oscillator, by L9, to a voltage variable attenuator consisting of CR6, CR7 and CR8. This attenuator is part of the closed loop leveling system consisting of the monitor diode CR20, the leveler amplifier, (located in the M10H module) and the voltage variable attenuator. The operation of this circuit maintains a constant amplitude RF signal at the monitor point and also allows adjustment of this signal over a 20dB range. Since the effective impedance at the monitor point is zero ohms, R46 establishes the output impedance at approximately 50 ohms.

Band 3 oscillator is almost identical to band 2. The oscillator tank inductance has been decreased and the oscillator transistor, Q14, is operated at a slightly higher current. The varactor bias is provided by Q9 and Q10 and the B-blanking is provided by Q11 and Q12. Current during the sweep retrace time is not completely removed but is steered by Q13 through CR12. This current will not cause oscillation since L15 has been by-passed. It does, however, provide better frequency stability in the oscillator. The RF signal is coupled from the oscillator, by L20, through the voltage variable attenuator consisting of CR17, CR18 and CR19 and to the RF output.

Q7 and Q8 help provide the proper bias to the shunt diodes in the voltage variable attenuators, in order to maintain a constant load for the oscillator, thus minimizing the frequency pulling effects of the attenuator.

Transistors Q15 and Q16 are switching transistors which connect the output of the leveling amplifier to the voltage variable attenuator associated with the operating band.

4.9 MARKER ADDER (MODULE M5H)

The main function of this module is adding together and amplifying the individual marker signals from the M6 marker modules. It also contains the external marker mixer circuit and the sweep sample selection and leveling circuits.

The desired sweep sample signal (band 1 or band 2 and band 3) is selected by the PIN diode switch CR4 and CR5. The sweep sample signal is then leveled in the same manner as the main RF output signal. The voltage from the monitor, CR7, and the reference voltage from R46 is fed to the leveling amplifier consisting of transistor stages Q12 and Q13. Q11 provides blanking of the leveling amplifier. Any error between the two input signals is amplified and fed to the voltage variable attenuator CR6. The operation of this circuit produces a constant amplitude signal at the monitor point.

The leveled sweep sample signal is connected to the external marker mixer, CR1 and CR2, and to the sweep sample output connector, J4. A 47 ohm resistor, which is connected between J4 and the monitor point, establishes the source impedance at approximately 50 ohm. The signal is then routed to each M6 marker module.

The marker output signals from the individual M6 marker modules are connected to the input pins 1, 2, 3, and 4 of the M5H module. One or two M6 outputs are connected to each input. The signals are then amplified in the input stages (Q2, Q3, Q4, and Q5) and combined in the common collector load. The collector load is an external 10mH choke when the Front Panel MARKER WIDTH Selector is set to "WIDE", or a 3.3k ohm resistor, R21, when the Width Selector is set to "NARROW." The combined marker signals are then amplified in transistor stages Q6, Q7 and Q8. The Front Panel Marker WIDTH Selecter also varies the high frequency gain of the amplifier by connecting capacitance across R27, the feedback resistor. The amplified signal is then fed to the complimentary output stage, Q9 and Q10, which is biased so that input signals less than 0.5 volts are not amplified. This eliminates most spurious markers and noise from the output. The output is then connected to the Front Panel MARKER SIZE Control and finally to the Front Panel SCOPE VERT. connector.

4.10 MARKERS (MODULE M6's)

Each marker module contains a crystal oscillator, a tuned or untuned mixer and a marker amplifier. Harmonic generator marker modules also include one or more harmonic generating stages.

Several types of marker modules are required to cover the wide frequency range and to produce both single frequency and harmonic type markers. A single frequency marker generator produces a marker at a single frequency while the harmonic marker generator produces markers at harmonically related frequencies of the crystal oscillator.

The model number for single frequency markers is M6S followed by the marker frequency. The model number for harmonic markers is M6H followed by the harmonic marker frequency.

The Crystal Oscillator operates between the frequencies of 100 kHz and 55 MHz. Several different types of oscillators are required to cover this range of frequencies. The 100 kHz oscillators use a tuned oscillator with the crystal operating at its fundamental frequency in a series resonant mode. The 1 to 17 MHz crystal oscillators are either tuned series resonant mode oscillators or untuned pierce type oscillators. The 17 to 55 MHz oscillators use a tuned Colpits oscillator with the crystal operating at its third overtone frequency in a series resonant mode. The tuning supresses the crystal fundamental and higher order resonant frequencies. The crystal and marker frequency are the same for frequencies between 100 kHz and 55 MHz. The markers above 55 MHz use harmonic generating techniques.

The output from the crystal oscillator (or harmonic generator) is combined with the sweep sample in the mixer stage. In the case of single frequency markers, the mixer includes a tuned circuit which selects the desired crystal or crystal-harmonic frequency and the sweep sample frequency. In the case of a harmonic marker, the mixer is untuned. The mixer circuit is generally a diode mixer, although transistor mixers are sometimes used. The fundamental and product signals are filtered from the mixer output, leaving the "difference signal" which is applied to the marker amplifier stage.

The marker amplifier is a single stage amplifier having a frequency response of several kHz to approximately 500 kHz. The output of the marker amplifier is connected through the SIZE Control to the output pin of the module.

4.11

The preceding paragraph, 4.10, described marker circuits in general. The circuits described below are the specific markers of the model 2001A and 2001B.

4.11.1 M66-59.5/1090/±4.5 MHz

This module contains two single frequency markers (59.5 MHz and 1090 MHz) and a side band circuit at 4.5 MHz.

The 59.5 MHz marker frequency is obtained from a 29.75 MHz crystal oscillator circuit (Q1). The 2nd harmonic is tuned by L4, C6 and coupled into a tuned mixer circuit consisting of L5, C8 and CR1. Birdies from this mixer are coupled through a low pass filter consisting of L6 and C10. If the side band oscillator is on, 4.5 MHz CW is coupled into the mixer through C11. C10 is tuned to emphasize the 4.5 MHz video, providing side band marker video of about the same amplitude as the 59.5 MHz marker.

Operation of the 1090 MHz marker is the same except for the harmonic generation section. A 54.5 MHz oscillator is doubled by CR3-CR4 and L11-C21 tunes to 109 MHz. Q5 amplifies harmonics of 109 MHz, and 545 MHz is selected by L12-C25. 545 MHz is coupled to the mixer diode CR5 where its 2nd harmonic is emphasized by the sweep sample tuning circuit L13-C27, which is tuned to the desired marker frequency of 1090 MHz. L18 couples 4.5 MHz from Q8 through C30 and C29 to produce the 4.5 MHz side bands.

4.11.2 M66-63/±.9/±.35 MHz

This module contains a single frequency marker 63.0 MHz and two side band circuits ±.9 and ±.35 MHz.

The 63.0 MHz marker frequency is obtained from 31.5 MHz crystal oscillator circuit Q1, the output of which is doubled by Q2 and 3, and coupled to the tuned FET mixer circuit consisting of L7, C8 and Q4. Birdies from this mixer are coupled through 63.0 MHz marker size control R12 to the low pass filter C11, 12 and L10 and then to the marker amplifier module.

The 900 kHz (±.9 MHz) side band frequency is obtained from a 32.4 MHz crystal oscillator, Q5, the output of which is mixed with the 31.5 MHz signal in the FET mixer, Q6. C21 couples the output to the 900 kHz tuned mixer L15, C27 and Q7 where it is mixed with the 63.0 MHz birdy.

When the 350 kHz (±.35 MHz) side band marker is on, the 31.15 MHz oscillator, Q8, output mixed with 31.5 MHz in FET, Q9, produces a 350 kHz difference frequency emphasized by L21, C33 and mixed with the 63.0 MHz birdy marker in Q10. C37, 38, 39 and L23 are a low pass filter which attenuates higher side bands.

4.11.3 M6H-5, 20, 30 MHz

Circuit functions for these markers are labeled on the M6H schematics. A tuned Colpitts oscillator with the crystal operating at its third overtone frequency in a series resonant mode drives a harmonic generator Q2. The CW comb is mixed with sweep sample in CR1 and the resultant birdies are amplified by Q3 and Q4, and coupled through the SIZE control R15 to pin 3 of the module.

4.11.4 M66H-.2/1 MHz

This module contains a 1 MHz harmonic marker and a side band 200 kHz marker generator.

A 1 MHz series crystal oscillator consisting of Q1, Q2 and Q3 drives a harmonic generator, consisting of Q4 and Q5, to produce a CW comb. The comb is mixed with a sweep sample in CR2 to produce birdies, which are then amplified by a video amplifier consisting of Q6, Q7 and Q8. The marker birdies are coupled through Q9 to pin 7 providing the 1 MHz marker output. A low pass filter, comprised of L7, L8, L9 and associated capacitors attenuate the 1 MHz oscillator signal, and any side band video frequencies higher than 500 kHz. This side band video is also used to produce 200 kHz markers by mixing with the CW comb from Q12, in CR4 and CR5, when 200 kHz B+ is applied.

The switch at pin 8 supplies B+ to the 200 kHz marker circuits and if the 1 MHz switch is not on, activates the 1 MHz section through diode CR3, while disabling the 1 MHz birdy output through Q9. The 1 MHz oscillator provides a clock for IC1 connected as a 5:1 frequency divider to produce a 200 kHz CW output. The first and second harmonics are coupled through Q12 into the 200 kHz mixer CR4-CR5. The 200 kHz signal and all video frequencies above 40 kHz are then attenuated by a low pass filter L12-L15. The birdy is then amplified by Q13 and coupled through the SIZE control R38 to pin 11 of the module, providing the 200 kHz marker output.

SECTION 5
MAINTENANCE

5.1 INTRODUCTION

This section provides information for testing, calibrating, and trouble shooting the sweep generator. The performance test is designed for incoming inspection and periodic evaluation. If performance is not to specifications, refer to the calibration and trouble shooting sections.

5.2 SERVICE INFORMATION

5.2.1 DISASSEMBLY INFORMATION

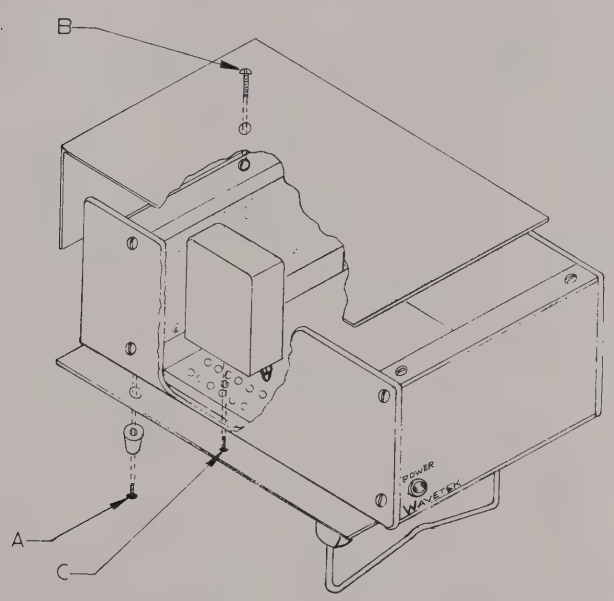


Figure 5-1. Disassembly

REMOVAL OF BOTTOM COVER—Remove the two rear feet (A) and lift cover off with a slight rear movement.

REMOVAL OF TOP COVER—Remove the single screw (B) from the top and lift off cover with a slight rear movement.

REMOVAL OF SIDE PANEL—Either side panel can be removed to provide better access by removing the four screws holding the side panel to the instrument. The Front Panel/Module Section can be removed from the power supply section by removing two screws holding the sections together and by disconnecting the electrical connectors between the two sections. NOTE: The separation of the two sections performs no useful purpose during normal service procedures.

5.2.2. MODULE SERVICING

SERVICE KIT K102—This service kit contains a module extender and RF extension cables which enables the module to be electrically operated while physically located above the rest of the modules, thereby making all parts easily accessible.

REMOVAL OF MODULE—Modules may be removed by removing any cables attached to the top of the module and removing the hold-down screw (C) from the bottom. Pushing up on the module ball studs will help free the ball studs from the chassis mounted spring clips.

REMOVAL OF MODULE COVER—Remove all nuts and screws from the top of the module and slide the cover off.

REINSTALLING MODULE—Before reinstalling the module, check the module pins for proper alignment, then carefully seat the module pins into the chassis socket and replace the hold-down screw (C) to insure a good ground connection between module and chassis.

MODULE PIN NUMBERING SYSTEM—The module pins are numbered as shown in Figure 5-2. The ball studs for the circuit modules are located off center to prevent the module's being plugged in backwards. This off-center ball stud location also provides a method for locating pin No. 1.

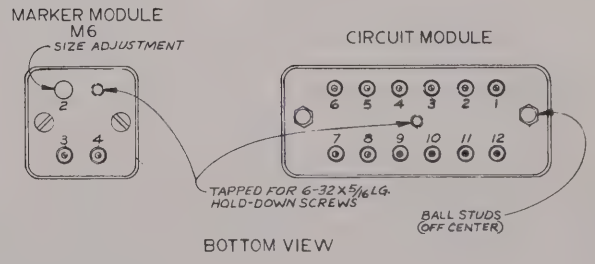


Figure 5-2. Module Pin Numbering System

5.2.3. TRANSISTOR LEAD CONFIGURATION—Transistor lead configurations are shown in Figure 5-3.

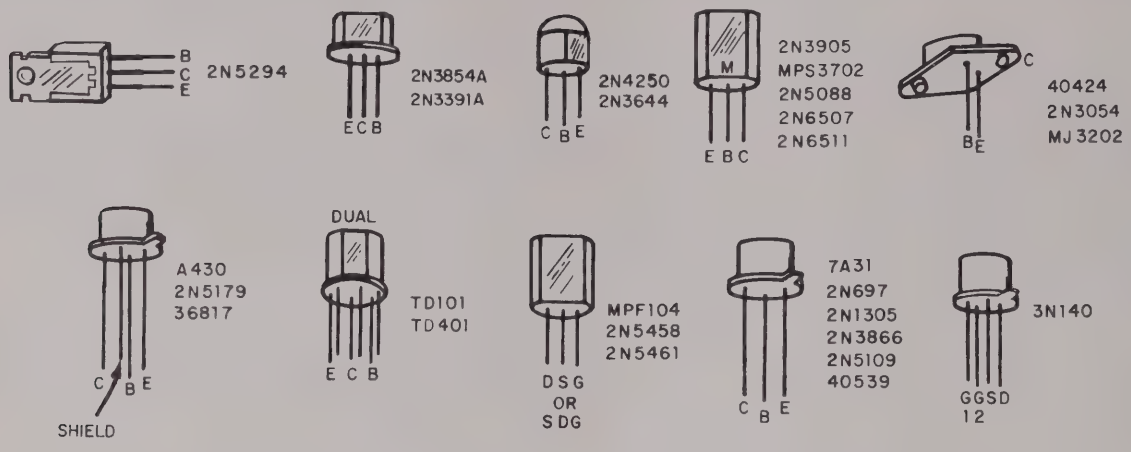


Figure 5-3. Transistor Lead Configuration

5.2.4 RECOMMENDED TEST EQUIPMENT—The following test equipment, recommended for servicing, trouble shooting, and calibrating the Wavetek Instrument is shown in Table 5-1.

TABLE 5-1 RECOMMENDED TEST EQUIPMENT

INSTRUMENT	CRITICAL REQUIREMENT	RECOMMENDED
Oscilloscope	DC Coupled 1mV/cm sensitivity	HP-130
Digital Voltmeter	0.1% Accuracy	Weston 1240
Power Meter	Frequency Range 10 to 1500 MHz	HP 432A/478A
Spectrum Analyzer	Frequency Range 10 MHz to 3 GHz	HP 8555A/8552A
Precision Attenuator Pads	10db 20db 40db	Weinchel 50-10 Weinchel 50-20 Weinchel 50-40
RF Detector	Halfwave Negative output-flat	Wavetek D-152 50 ohm
Harmonic Marker Generators	10 MHz 50 MHz	Wavetek M6H-10 Wavetek M6H-50
CW Signal Generator	Tunable to any Frequency within the frequency range of the sweep generator. Accuracy ±5 MHz Output 0.1V	
Counter		**Eldorado 1615CY1**

5.3 PERFORMANCE CHECKS

The following procedure is intended to ensure that the instrument meets its published specifications. The checks specified, assume that the instrument is equipped with A-2 options at 10 MHz and 50 MHz in addition to the 0.2/1.0 MHz markers already installed as part of this instrument.

While it is possible to check the instrument's performance without the use of harmonic markers, by using suitable external CW sources, a complete check by this method is impractical.

5.3.1 TYPICAL SET-UP

Connect the Sweep Generator, RF Detector and Scope as shown in figure 5-4.

Adjust the sweep generator controls as follows.

FREQUENCY BAND to 0-500 MHz, FREQUENCY to 250 MHz, output dBM to 0, LEVEL to +9, SWEEP TIME to line, PULL/TRIG and PULL/TILT to their "in" position, SWEEP WIDTH to its maximum clockwise position and the SWEEP WIDTH RANGE switch to 500 MHz.

Adjust the scope to operate in an X-Y mode. Set the vertical sensitivity to 0.2 volt/cm. Adjust the vertical position, horizontal position and horizontal sensitivity to obtain a scope pattern as shown in figure 5-5. Adjust the sweep generator harmonic marker controls as follows. Turn on the 50 MHz markers, adjust the marker width to wide and marker size to produce a marker amplitude similar to that shown in figure 5-5.

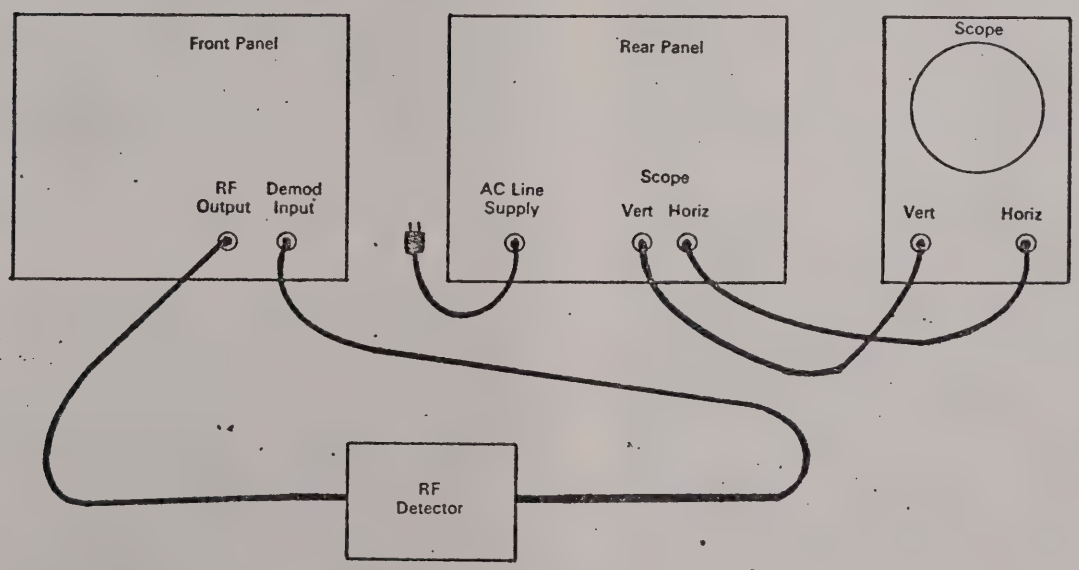


Figure 5-4. Typical Set Up

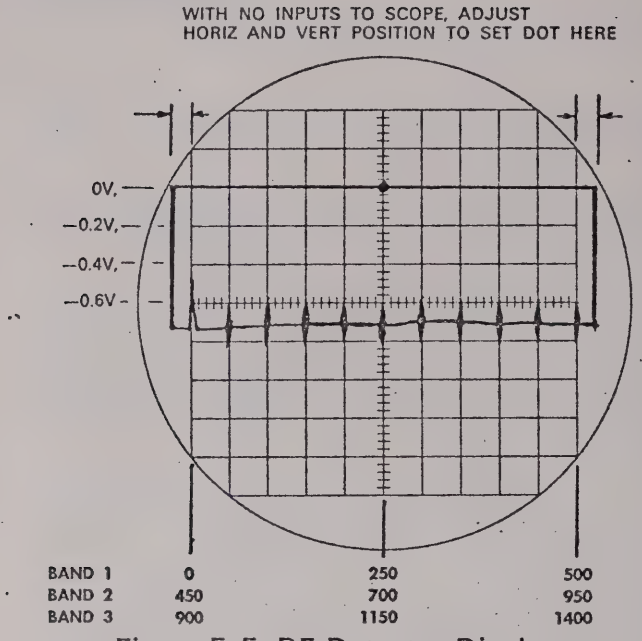


Figure 5-5. RF Detector Display

5.3.2 DISPLAY LINEARITY, MAXIMUM SWEEP WIDTH AND FREQUENCY RANGE CHECK

Display linearity is read directly from the display shown in figure 5-5. Each marker must fall within ±0.2 cm from each centimeter line on the graticule, this is equivalent to a display linearity of 2%. This 2% specification is extremely important since all dial accuracy specifications are directly related to it. Repeat check on BANDS 2 and 3, an external CW signal can be connected to the EXTERNAL MARKER IN connector to identify one of the 50 MHz harmonic markers. This also verifies the operation of the external marker circuit.

Maximum sweep width of 500 MHz is also read directly from the display of figure 5-5.

To identify the frequencies shown on the display of figure 5-5, one frequency or marker must be positively identified. All remaining frequencies can be identified by referencing to this frequency. For the 0-500 MHz, low band, the low limit marker is not a marker but the zero lock-in produced by the heterodyne sweep generator technique. The frequency of each marker shown on the display can be identified by referencing to the zero lock-in point. For the 450-950 and 900-1400 MHz bands, one frequency can be identified by using an external CW generator and the EXT marker generator circuits of the instrument. By referencing to the marker produced by the known EXT CW signal, the exact frequency of each marker on the display is obtained.

Since the frequency indicated at the exact center of the display of figure 5-5 is the same as the output frequency when the instrument is operated at minimum sweep width, the center frequency range of the instrument can be checked by simply turning the FREQUENCY (coarse) control to its extremes and noting the range of frequencies indicated at the exact center of the display. The low and high limit markers should move past the display center line by approximately 1/2CM. This represents approximately a 5% overrange capacity.

LOW FREQUENCY LIMIT CHECK

Turn on the 10 MHz harmonic marker and adjust the FREQUENCY (coarse) and SWEEP WIDTH controls to position the zero lock-in point centered on the extreme left scope graticule line and the first 10 MHz harmonic marker centered on the extreme right scope graticule line. Turn on the 1 MHz harmonic markers and counting down from the 10 MHz marker, locate the marker which corresponds to 1 MHz.

The output must be flat (constant amplitude) down to the 1 MHz marker. This verifies the low frequency limit.

5.3.3 DIAL ACCURACY CHECK

Dial accuracy is checked in a manner similar to the frequency range check just completed.

Set the FREQUENCY (coarse) control to position the zero lock-in or the low limit harmonic marker to the center of the display. Reduce the sweep width to approximately 10 MHz to provide the necessary resolution. Turn the 50 MHz harmonic marker off and turn the 10 MHz harmonic marker on. Center the marker on the display with the FREQUENCY (coarse) control (make sure the indicator line on the FREQUENCY (fine) control is aligned to the frequency indicator and remains in this position during the entire check) and read the frequency error on the FREQUENCY (coarse) dial. Allowable error is ±10; MHz or 1% of frequency whichever is greatest. Next advance the FREQUENCY (coarse) control until the next 10 MHz harmonic marker is centered on the display and again read the error on the FREQUENCY (coarse) dial. Continue this process until the entire frequency range has been verified on all bands. Use the 50 MHz harmonic markers to establish a starting point on the 450-950 and the 900-1400 MHz bands.

5.3.4 MINIMUM SWEEP WIDTH CHECK

The minimum sweep width on the 0-500 MHz band is 50 KHz and is verified as follows:

Adjust the unit as outlined in paragraph 5.3.1. Turn off the 50 MHz markers, turn on the .2 MHz markers, set the sweep width range switch to 10 MHz, and set the marker width to narrow. Reduce the sweep width control and adjust the frequency control until a 200 MHz marker is positioned on the extreme right scope graticule line. The display is now calibrated for a sweep width of 20 MHz per division. Adjust the frequency control (vernier) to position one of the 200 KHz markers exactly centered on the scope display. Adjust the marker width to produce a marker width approximately equal but slightly wider than the minimum sweep width specification. The minimum sweep width specification is 50 KHz which is equal to 2½ centimeters.

Since the marker presentation has sloping sides it should be possible somewhere along its amplitude to locate a point where its width exactly equals the

minimum sweep width specification. Now decrease the sweep width to minimum and ensure that the marker, at the amplitude point corresponding to the minimum sweep width specification covers the entire scope display.

The minimum sweep width on the 450-950 and the 900-1400 MHz bands is 200 KHz and is verified by adjusting the frequency and sweep width of 200 KHz as outlined above.

5.3.5 MAXIMUM OUTPUT CHECK

Set the band switch to 0-500 MHz and the frequency dial to 300 MHz. Set sweep width control for CW operation.

Turn step Output control to 0dBM. Turn the level control to +9. Set power meter to +10dBM range and connect the power meter's thermistor mount to the RF output connector. The power meter should read +9dBM, ±.5dB.

5.3.6 FLATNESS CHECK

Assuming the sweep generator has been set-up as outlined in paragraph 5.3.1 proceed as follows.

Decrease the scope's horizontal sensitivity to produce a display width of approximately 4 cm. Increase the scope's vertical sensitivity and adjust the vertical position control until the display occupies exactly 10 cm between the zero level retrace line and the maximum amplitude point. Check all three bands to locate the maximum amplitude points. The minimum amplitude point must be 8.9 cm or more for a flatness specification of ±.5dB check all three bands to locate the minimum amplitude points.

5.3.7 CW MODE CHECK

Adjust the sweep width control fully counterclockwise until an audible "click" is apparent. This position removes the return trace blanking and sweep drive from the oscillator. The output frequency is controlled by the FREQ (coarse) and (vernier) controls and the accuracy is identical to the FREQ dial accuracy check performance in paragraph 5.3.3. The output amplitude is the same as in the sweep mode of operation with the absence of the zero level return reference.

5.3.8 FREQUENCY DRIFT CHECK

Return to typical set-up of paragraph 5.3.1 and again calibrate the display's sweep width to 1 MHz. Position the marker to the exact center of the oscilloscope display and read frequency drift directly from the scope display by noting the change in the markers position with time. Each centimeter represents 100 KHz. When reading drift over long periods of time, calibrate the display sweep width to 5 MHz, using the 1 MHz harmonic marker. Next turn off the 1 MHz marker and turn on the 50 or 10 MHz harmonic markers. Center a marker on the scope display and read drift as before, except each centimeter now represents 500 KHz.

Maximum allowable drift is indicated in paragraph 1.2.

5.3.9 RESIDUAL FM CHECK

Readjust SWEEP WIDTH to produce a calibrated frequency display of exactly 1 MHz for a 10 cm display. Adjust the FREQUENCY (fine) control to center one of the 1 MHz harmonic markers on the scope display. Increase the horizontal sensitivity by a factor of ten. Use the horizontal step V/cm control only and do not turn the horizontal vernier control as this would change the calibration. The display is now calibrated to indicate 10 KHz/cm.

Residual FM can be read directly on the scope display by noting the amount of jitter of the marker.

Change the SWEEP TIME from LINE to the 0.1-0.01 position and again read the marker jitter. Any additional jitter in this position represents the line related residual. Maximum allowable jitter is indicated in paragraph 1.2.

5.3.10 SPURIOUS SIGNAL CHECK

Checking for spurious signal content is not normally required for periodic calibration, only for incoming inspection. The only practical way to measure spurious signal content is with a high quality spectrum analyzer covering from 10 MHz to at least two times the upper frequency range of the unit to be checked. The spurious check is made in accordance with the instructions furnished with the particular spectrum analyzer being used.

The specifications for spurious signal content is listed in paragraph 1.2.

The hetrodyning method of generating the output signal for the 0-500 MHz band will give non-harmonically related spurious signals in addition to the harmonically related signals. These signals are typically 40 to 50dB below the output signal up to 300 MHz and should increase to no more than 26dB below the output signal near the High end of the frequency range.

5.3.11 ATTENUATOR CHECKS

11dB step attenuator and 9dB level vernier: The 11dB step attenuator and the 9dB level vernier are checked together since they both control the output amplitude by programming a 0-20dB pin-diode-attenuator. Their accuracy is checked with the power meter.

Set up the instrument and power meter exactly as outlined in paragraph 5.3.5. After reading the maximum output of +9dBM continue by reducing the output in 1dB steps with the 11dB step attenuator until the output of −1dBM is obtained. Note the power meter reading at each 1dB increment, the maximum allowable error is ±.5dB.

In order to check its accuracy over its entire 20dB range, continue by setting the front panel level control to "CAL" and rotating the 11dB step attenuator to 0. Again reduce the Output in 1dB steps with the 11dB step attenuator until an output of 11dBM is indicated: Note the error on the power meter at each 1dB increment. Allowable error is +0.5dB.

70dB Attenuator: The accuracy of the step attenuator can be measured by using a suitable Attenuation Test Set or by directly substituting precision RF attenuator pads for each 10dB step of the attenuator. The difference between the two outputs represents the attenuator error. An RF detector can be used to recover the signal at levels down to approximately −40dBm. Below this level an RF amplifier or sensitive receiver (spectrum analyzer) must be used. Allowability error is ±0.5dB to 500 MHz, ±1dB to 1000 MHz, and ±2dB to 1400 MHz. This error is that produced by the step attenuator alone and does not include the basic flatness or the vernier attenuator error.

5.3.12 SWEEP TIME CHECK (Horizontal Output Check)

Connect the horizontal output of the sweep generator to the oscilloscope vertical input. Adjust the oscilloscope controls for an internally generated, automatic, line triggered sweep of 2 ms/cm and a vertical sensitivity of 2V/cm. Adjust the sweep generator SWEEP TIME selector to LINE lock and ensure that the PULL/TRIG switch is pushed in. Adjust the oscilloscope vertical position, horizontal position, and trigger level to obtain the waveform shown in figure 5-6.

Adjust the sweep generator SWEEP TIME selector to .1-.01 position. Ensure that the VARIABLE MANUAL control is fully clockwise. The wait time should disappear and the sweep time should be less than 10ms with approximately equal sweep time and retrace time periods. Adjust the oscilloscope time base to 50ms/cm. Adjust the sweep generator VARIABLE/MANUAL control fully counterclockwise. The sweep time should be more than 100ms with approximately a 10:1 ratio between the sweep and retrace time periods.

NOTE: The retrace time period remains constant within any one SWEEP TIME range setting and the VARIABLE/MANUAL control varies the sweep time period. With the VARIABLE/MANUAL control fully clockwise the sweep and retrace times are both approximately 0.01 seconds. With the control fully counterclockwise the sweep time becomes approximately 0.1 seconds and the retrace time remains 0.01 seconds. On the next lower range (1-.1) the retrace time would remain 0.1 sec. and the sweep time would vary from 0.1 to 1 seconds.

Repeat these checks for the 1-.1, 10-1, and 100-10 sec positions of SWEEP TIME selector switch. Adjust oscilloscope time base as necessary to ensure that the VARIABLE/MANUAL control will adjust the sweep time from faster than the maximum to slower than the minimum specifications for each range.

Adjust the SWEEP TIME selector to MANUAL and adjust the VARIABLE/MANUAL throughout its range. A DC voltage should be present that is variable from −8V, ±0.5V with the control fully counterclockwise to +8V, ±0.5V with the control fully clockwise.

Adjust the SWEEP TIME selector to the .1-.01 position and pull the PULL/TRIG switch. The sweep should now be disabled. Each depression of the front panel TRIG switch should produce one complete sweep cycle.

NOTE: The triggered mode of operation is only possible in the variable rate positions and will not operate in the LINE lock position of the SWEEP TIME selector.

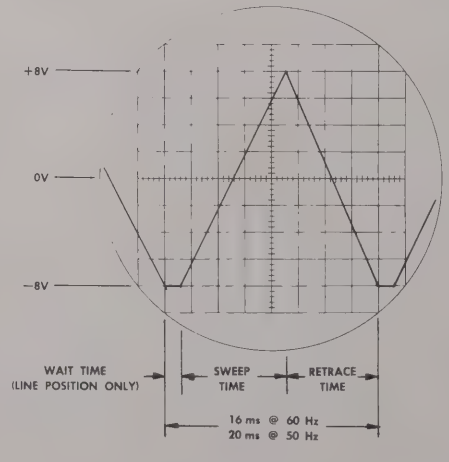


Figure 5-6. Scope Horizontal Output

5.3.13 MARKER SYSTEM CHECK

Connect the equipment as outlined in par 5.3.1. The following check is for a harmonic marker. Specifications, with the exception of spurious markers are the same for either single frequency or harmonic type markers and the procedure for verification of performance does not differ.

Single frequency markers should have no spurious markers throughout the swept range. Harmonic type markers may or may not have small spurious markers at one half or one third the specified marker interval.

MARKER SIZE

Observe the markers and ensure they are of equal amplitude throughout the range.

Set the oscilloscope vertical gain to 2V/cm and adjust the MARKER SIZE control fully clockwise. The markers should be approximately 12V peak to peak in amplitude. Adjust the MARKERS SIZE control fully counterclockwise and set the oscilloscope vertical gain to 5mV/cm. The markers should be less than 15mV peak to peak in amplitude. Remove the sweep generator's bottom cover and position the marker CLAMP switch to its clamp position. (This slide switch is located directly behind the front panel DEMOD IN connector. Normal position is with slide lever toward center of instrument, the clamp position is with slide lever toward the right side panel.) Positive rectified markers should be present for use with X-Y recording instruments. The amplitude will be dependent on the output impedance of the RF detector being used. The amplitude should be adjustable from approximately 6V maximum to 1mV minimum with a detector impedance of 1 meg ohm, or from 0.5V to 1mV with a detector impedance of 0 ohms. NOTE: The sweep width must be decreased or the sweep time increased to observe the rectified marker. Return the marker clamp switch to its normal position and replace the instrument's bottom cover.

MARKER TILT

Pull the PULL TILT switch out. Adjust the MARKER SIZE control throughout its range and note that the birdy marker is adjustable from a 12V peak to peak vertical marker to a horizontal marker having a size approximately equal to 10% of the horizontal deflections (1cm on a 10cm deflection).

MARKER WIDTH

Return the PULL TILT switch to its "in" position. Turn on the 1 MHz markers and adjust the MARKER SIZE control to approximately a 4 cm peak to peak marker. Set the marker width selector to its widest position. Adjust the CENTER FREQUENCY and SWEEP WIDTH controls to calibrate the oscilloscope for a 1 MHz sweep width.

Adjust the CENTER FREQUENCY to center the birdy zero beat on the oscilloscope center graticule line and note that the marker width is approximately 400 kHz wide (each cm equals 100 kHz). Decrease the MARKER WIDTH switch one position and note that the marker is approximately 200 kHz wide. Decrease the MARKER WIDTH switch one position and note that the marker is approximately 100 kHz wide. Decrease the MARKER WIDTH switch to the most narrow position. The marker is now approximately 15 kHz wide.

MARKER ACCURACY

Test points for reading the crystal oscillator frequencies are provided on top of each marker module, See figure 5.14. Turn on the desired marker, connect the Counter to the Test point and read the crystal oscillator frequency. Allowable error is 0.002% after a 2 hour stabilizing period at an Ambient temperature of 25°C.

For marker frequencies between 1.0 and 55 MHz the crystal oscillator frequency and the marker frequency are the same. Markers below 1 MHz divide the crystal oscillator frequency. Markers above 55 MHz multiply the crystal oscillator frequency.

The following table shows the oscillator frequencies for corresponding birdy markers.

MARKER	CRYSTAL OSCILLATOR
0.2 MHz	1 MHz
59.5 MHz	29.75 MHz
1090 MHz	54.5 MHz
4.5 MHz sidebands	4.5 MHz
63.0 MHz	31.5 MHz
0.35 MHz sidebands	31.15 MHz
0.9 MHz sidebands	32.4 MHz

After checking the accuracy of the crystal oscillators, the correct multiplication or division must also be verified. The correct multiplication of the single frequency markers can be verified by comparing the marker to the 50 MHz harmonic marker comb as shown in the typical RF detected display in Figure 5.5.

The correct division of the 0.2 MHz harmonic can be verified by checking the number of 0.2 MHz markers between two adjacent 1 MHz harmonic markers.

5.3.14 EXTERNAL PROGRAMMING

External programming inputs are not normally checked during incoming inspection unless these special functions are to be used in a particular application. The external programming circuits are covered in section 3 under Operating Instructions. If it is necessary to check these functions at incoming inspection, reference can be made to that section of the manual for complete setup instructions.

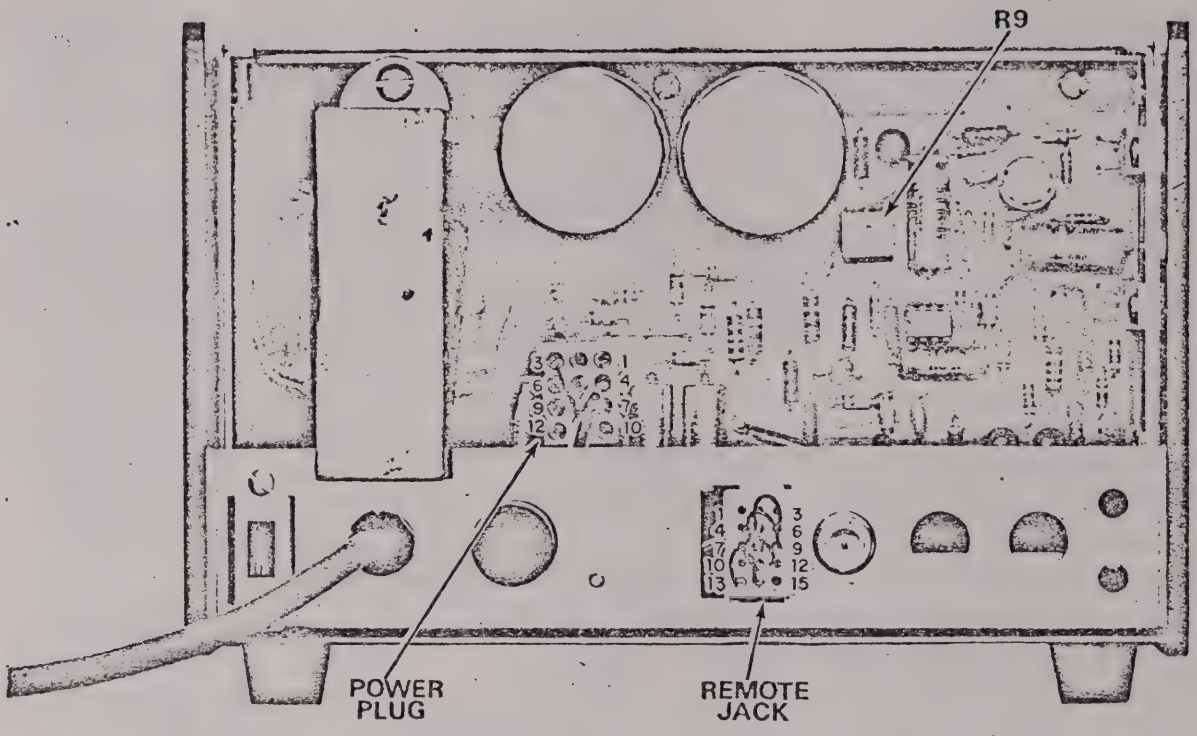


Figure 5-7. Power Supply

5.4. CALIBRATION PROCEDURE

Remove top cover, bottom cover, left side panel and M2J module cover. Allow a 15 minute warm-up period before calibrating.

In general, calibration must be performed in the sequence given. Refer to figure 5-7, 5-8, 5-9 and 5-14 for adjustment and test points.

5.4.1. +18 VOLT ADJUSTMENT

Connect the digital voltmeter to the +18 volt supply, pin 6 on the power plug and adjust R9 to produce +18V, ±10mV. (See figure 5-7).

5.4.2 −18 VOLT CHECK

Connect the digital voltmeter to the −18 volt supply, pin 4 on power plug. The reading must be −18 volts, ±50mV.

5.4.3 −20 VOLT CHECK

Connect the digital voltmeter to the 20 volt supply, pin 5 on the power plug. The reading must be −20 volts, ±0.3V.

5.4.4 −16 VOLT CHECK, **CAUTION:** The + and −16 Volt supplies are not short circuit protected.

Connect the digital voltmeter to the −16 volt supply, pin 3 of the remote jack. It must read −16 volts, ±0.1 volt. (Record reading).

5.4.5 +16 VOLT ADJUSTMENT

Connect the digital voltmeter to the +16 volt supply, pin 2 of the remote jack. Adjust R55 (see figure 5-8) to obtain exactly the same voltage, but of opposite polarity, as recorded for the −16 volt supply in paragraph 5.4.4.

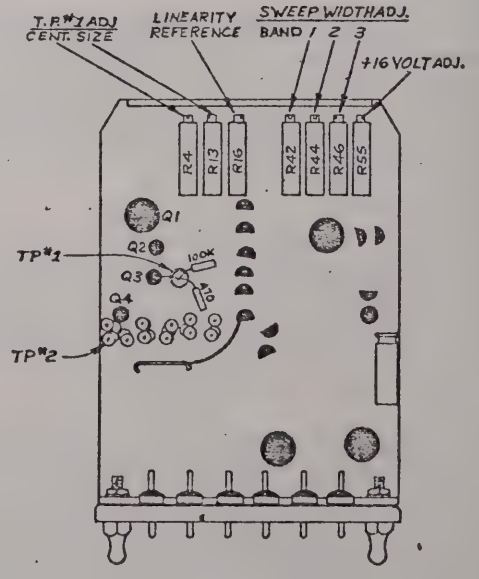


Figure 5.8. M2J

5.4.6 SWEEP RATE ADJUSTMENTS—MODULE M1H
Set Front Panel controls as shown in Figure 5-9. Connect the scope vertical input to the output of the rate generator, pin 10 of the REMOTE jack, and adjust the scope vertical and horizontal time base controls to produce a stable pattern similar to Figure 5-10. Adjust M1H CENT control to obtain an output symetrical about zero volts and the M1H SIZE control to obtain the 32 volt, peak-to-peak, amplitude.

See figure 5-9 for control locations.

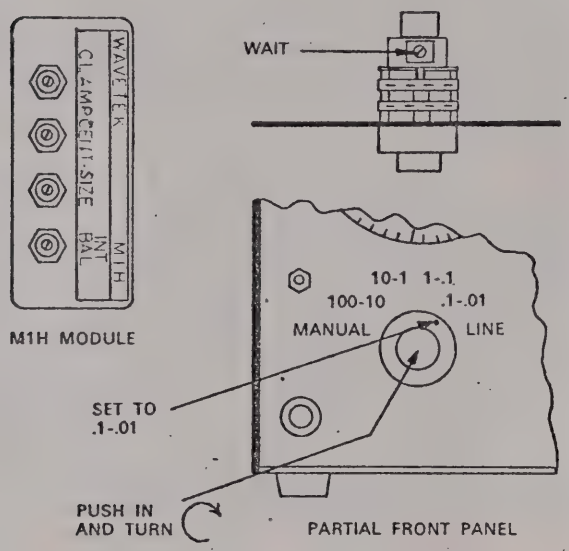


Figure 5-9. M1H Adjustments

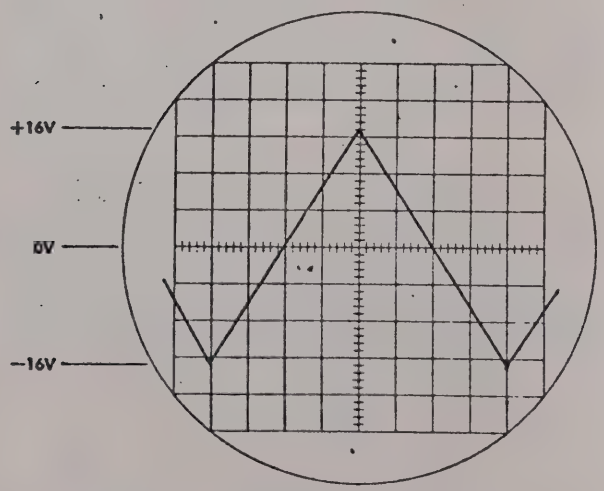


Figure 5-10. M1H Center and Size Adjustment

These adjustments should be made as precisely as possible. The + and −16 volt references available at pin 2 & 3 of the remote jack can be used to check the accuracy of the vertical calibration of the oscilloscope.

Next, set the Front Panel VAR/MANUAL control fully CCW and adjust the M1H INT/BAL to produce a sweep time of 0.12 seconds. See Figure 5-11.

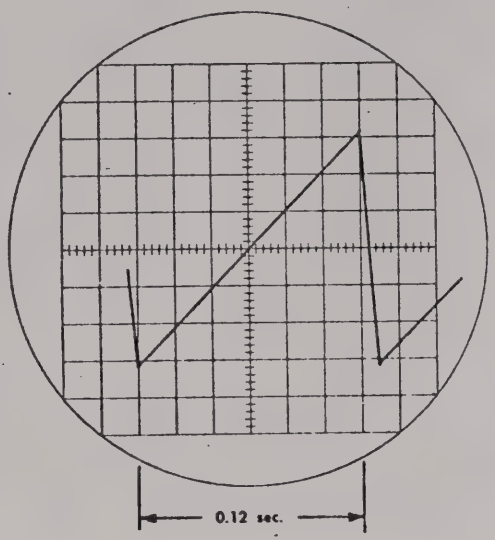


Figure 5-11. M1H Internal Balance Adjustment

Then set the Front Panel SWEEP TIME to LINE and adjust the M1H CLAMP control to clamp the negative going peak of the M1H output to −16 volts. See Figure 5-12.

Finally, adjust the WAIT control, mount on rear of the SWEEP TIME switch assembly, (see Figure 5-9) until the wait time as shown in Figure 5-12 is approximately 1 millisecond.

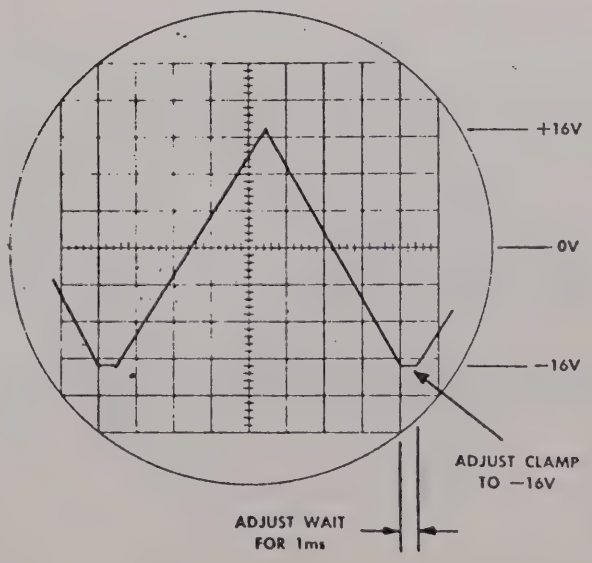


Figure 5-12. M1A Clamp and Wait Adjustment

5.4.7 SWEEP DRIVE ADJUSTMENTS—Module M2J

Connect the scope vertical input to test point #1 in the M2J module (see figure 5-8). Set the front panel frequency control (coarse) to produce 0V at pin 6 of the module. The center frequency dial must read 250 MHz on the 0 to 500 MHz scale. If not, loosen the set screw holding the frequency dial to its shaft and reposition. Next, see the frequency (vernier) control to produce −8V at pin 8 of the module. The indicator line on the frequency (vernier) must be pointing toward the frequency indicator. If not, loosen screw and reposition. Next, set the front panel sweep width control completely counter-clockwise (CW position) and adjust R4 to produce 0V at test point #1. Next set the front panel sweep width control to maximum (completely clockwise, and sweep width range switch in the 500 MHz position) and adjust R13 to produce a 28V peak to peak signal at test point #1.

Without disturbing the Front Panel CENT FREQ or SWEEP WIDTH adjustments return the scope to an X-Y operating mode with the HORIZ OUTPUT of the sweep generator driving the scope X input. Set the SWEEP TIME to .1-01 sec and adjust the SCOPE display width to 11cm (0.5cm overlap on each end). See figure 5-13a.

Connect the scope "Y" input to M2J test point #2, which is the top side of any of the three diodes adjacent to M2J, Q4. (Linearity correcting resistors may or may not be connected to the diodes depending on the inherent linearity of the sweep oscillator.) Adjust M2J, R16 to position the "knee" approximately ⅜cm to the left of the 10cm mark, as shown in figure 5-13b. The M2J cover and left side panel may now be replaced.

5.4.8 LEVEL ADJUSTMENTS

Adjust the controls as follows, BAND to 0-500 MHz, FREQUENCY to 300 MHz, SWEEP WIDTH to "CW" position (completely counter-clockwise), OUTPUT to 0dBm and LEVEL to "+9". Set the power meter to +10dBm range and connect its thermistor mount to the RF OUTPUT connector. Connect the digital voltmeter to pin 7 of the M10H module.

Adjustments to be made are R123 and R138 which are located on a bracket fastened on the rear of the step attenuator (see figure 5-14) and the LEVEL MIN and MAX controls which are located on top of the M10H module.

With the unit set up as outlined, first check the voltage at pin 7, it must be -10, ±0.2 volts. Next, adjust the LEVEL MAX control to produce a reading on the power meter of +9 dBm. Set the front panel LEVEL control to "CAL" and adjust R123 for a voltmeter reading of -3.45 V. Set the front panel LEVEL to +9 and adjust small OUTPUT knob for -9 dB, then set R138 for voltmeter reading of -3.45 V. Set the front panel LEVEL to "CAL", the step attenuator to -11, and adjust the LEVEL MIN control to produce a power meter reading of -11.1 dB. Some interaction exists between the LEVEL MIN and MAX controls, therefore, repeat these adjustments until both the MAX and MIN readings are obtained.

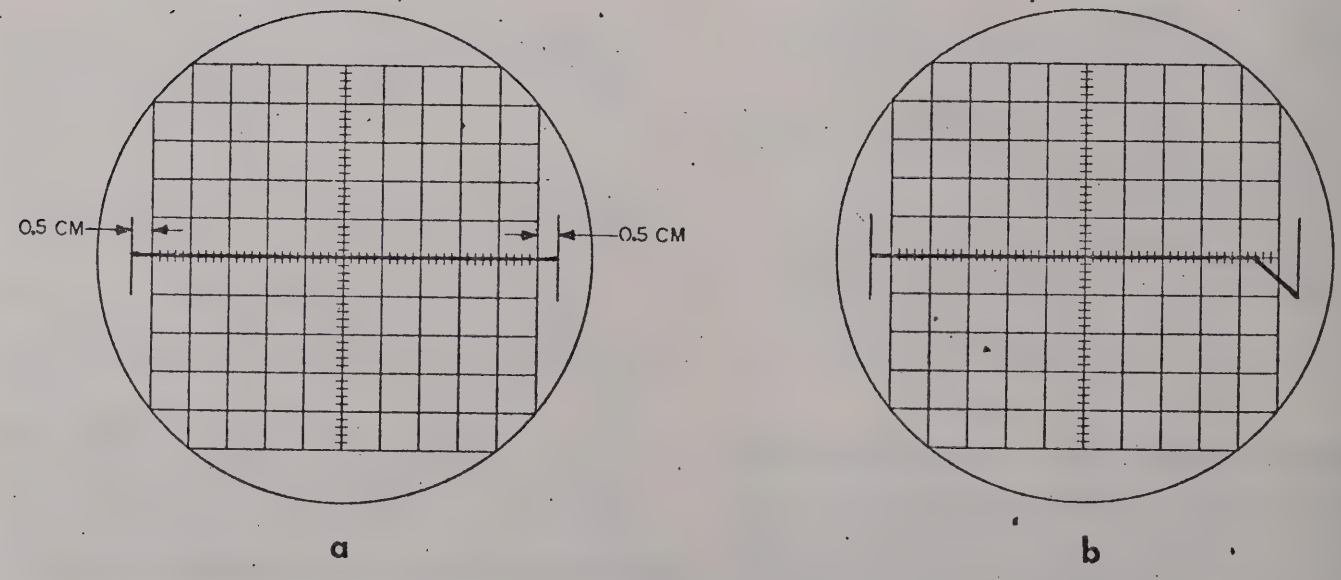


Figure 5-13. Linearity Ref Adjustment

5.4.9 CENTER FREQUENCY ADJUSTMENT—M9-

Connect the Sweep Generator, Scope and Detector as shown in the typical set-up, figure 5-4. Preset the front panel controls as follows: Band to, 0-500 MHz, Frequency (coarse) to 250 MHz, Frequency (fine) adjust line on control knob to point toward frequency indicator. Set the sweep width control to its maximum clockwise position. Set the RF Output and LEVEL controls for maximum output and the sweep time control to line position. Turn on the 50 MHz harmonic marker and adjust marker width to wide and marker size for a display similar to that of figure 5-5. Locate the harmonic marker corresponding to 250 MHz (count up from the zero lock-in point). Adjust the M9H centering control to position this marker to the exact center of the display. Gradually reduce the front panel Sweep Width control to minimum while readjusting the M9 centering control to maintain the marker centered on the display.

Change the Band switch to 450 to 950 MHz. Return the sweep width control to maximum. Locate the 50 MHz Harmonic marker that corresponds to a frequency of 700 MHz. (Use a CW signal generator and the external marker circuit to identify the proper 50 MHz harmonic marker). Adjust the M19H CENT BAND 2 control to position the 700 MHz marker to the exact center of the display. Gradually reduce the front panel Sweep Width control to minimum while readjusting the M19H CENT BAND 1 control to maintain the marker centered on the display.

Change the Band switch to 900 to 1400 MHz. Return the sweep width control to maximum. Locate the 50 MHz Harmonic Marker that corresponds to a frequency of 1150 MHz. (Use a CW signal generator and the external marker circuit to identify the proper 50 MHz harmonic marker). Adjust the M19H CENT BAND 3 control to position the 1150 MHz marker to the exact center of the display. Gradually reduce the front panel Sweep Width control to minimum while readjusting the M19H CENT BAND 2 control to maintain the marker centered on the display.

5.4.10 SWEEP WIDTH ADJUSTMENT—M2J

With the unit operating as set-up in paragraph 5.4.9. Reposition the Frequency (coarse) control to indicate 0 MHz make sure the Frequency (fine) control is not disturbed. Return the front panel Sweep Width control to its maximum clockwise position and adjust the M2J Sweep Width 1 to position the zero lock-in point to the center of the display. Reduce the Front Panel Sweep Width control to minimum while readjusting the M2J Sweep Width 1 control to maintain the zero lock-in point centered on the display.

Change the BAND switch to 450 to 950 (don't disturb the Coarse or Fine Frequency controls). Return the front panel sweep width control to maximum and locate the 50 MHz harmonic corresponding to 450 MHz (Use an external CW signal generator and the external marker circuit to identify the proper 50 MHz harmonic). Adjust the M2J SWEEP WIDTH 2 to position the 450 MHz marker to the center of the display. Reduce the front panel SWEEP WIDTH control to minimum while readjusting the M2J SWEEP WIDTH 2 control to maintain the 450 MHz marker centered on the display.

Change the BAND switch to 900 to 1400 (don't disturb the Coarse or Fine Frequency controls). Return the front panel sweep width control to maximum and locate the 50 MHz harmonic corresponding to 900 MHz (use an external CW signal generator and the external marker circuit to identify the proper 50 MHz harmonic). Adjust the M2J SWEEP WIDTH 3 to position the 900 MHz marker to the center of the display. Reduce the front panel SWEEP WIDTH control to minimum while readjusting the M2J SWEEP WIDTH 3 control to maintain the 900 MHz marker centered on the display.

5.4.11 SWEEP SAMPLE ADJUSTMENT—Module M5G

Connect the RF detector to the SWEEP SAMPLE OUT Jack of the module, using the adapter cable supplied in the service kit, and adjust the SWEEP SAMPLE ADJ. to produce a detected output of approximately 35 millivolts.

5.4.12 MARKER SIZE ADJUSTMENT—Module M6

Each marker module has a SIZE adjustment potentiometer which is accessible from the under side of the sweep generator, when the bottom cover is removed. (See figure 5-2). The control is adjusted until a saturated marker is obtained on the scope display when operating the unit as shown in the typical set-up, Figure 5-4. A saturated marker is obtained when a further increase in the marker modules SIZE adjustment does not increase the marker amplitude on the scope display. Increasing the size adjustment beyond this point will result in spurious markers on the display.

The M66 module used with TACAN option markers has three SIZE adjustment potentiometers accessible through the top cover.

5.5 TROUBLESHOOTING

Trouble shooting is generally a systematic procedure of "divide and conquer." A thorough understanding of the block diagram and circuit description located in Section 4 of this manual will enable the trouble symptom to be associated with a particular module. Once this has been accomplished the module can be replaced or trouble shot with the aid of the module schematic. A problem in a power supply often causes many symptoms pointing to other areas and should be checked when the symptom does not clearly indicate a specific problem. The +18, −18, and −20V supplies are located on the rear chassis printed circuit board and the +16 and −16 reference voltage supplies are located in the M2J module. Performance of these supplies are indicated in the calibration procedure.

5.5.1 TROUBLESHOOTING HINTS

The following is a list of several typical symptoms followed by the probable cause or a trouble shooting procedure.

INTERMITTENT OPERATION OF ANY TYPE—Defective module pin sockets or loose RF cables.

NO RF OUTPUT

ALL THREE BANDS—Defective attenuator or RF cables connecting to the input or output of the attenuator.

SINGLE BAND ONLY—Check for the presence of the band switching voltages, B-1, B-2, and B-3 at module M9H, M10H, and M19H as shown on the Module Wiring Diagram.

RF OUTPUT NOT FLAT—Most common cause is the external RF detector deing defective. Another is the monitor diode located in the M19H module. This is a point contact diode and can be damaged if the RF output is momentarily connected to a B+ voltage. A good monitor diode will produce a negative detected voltage (pin 8 of M18H) approximately twice the amplitude of the external detector. For example, at an RF output of +9dBM an external RF detector will read approximately 0.7V. The internal monitor, pin 8 of M19H, will read approximately −1.2V.

FREQUENCY UNSTABLE (JITTER)—Check all modules for loose hold-down screws, especially module M2J. Check the + and −16V reference supplies Operating the unit in a strong magnetic field, such as setting on top of or adjacent to another instrument containing a large power transformer, can produce 60 Hz HUM modulation.

SWEEP RATE PROBLEM—Probable cause is a defective M1H module or wiring to the Front Panel SWEEP TIME selector switch. See the calibration procedure for verifying proper operation.

NO RF SWEEP—First check pin 12 of the M1H module for the presence of a 32V ramp. This ramp indicates proper operation of the M1H. Next check for the ramp at the input of the M2J pin 7. Finally check the output of the M2J at pin 9. It should be similar to the input except it will be lower in amplitude, approximately 12V peak-to-peak, and will have an average value of 0V when the Front Panel center frequency control is set to mid-band. If the M2J output is correct the trouble would probably be in the M9H or M19H sweep oscillator module.

MARKER PROBLEMS

To isolate the cause of a marker problem when the symptom does not clearly indicate a specific circuit or component, first, with an RF detector, check the sweep sample output at the M5H Sweep Sample Out connector. It should be a detected signal between 30 to 50mV. If the proper sweep sample signal is not present it indicates that the trouble is in the sweep osicllator module or connecting sweep sample cables.

Next, connect the detector in place of the terminating plug P102. A signal at this point indicates all jumper cables and RF jacks on the M6 or M66 modules are intact. Then check for the birdy output at the proper pin of the marker module. A 10 to 15mV peak-to-peak birdy is sufficient to drive the M5H module and indicates the M6 module is operating properly. With the 15mV peak-to-peak birdy present at the input of the M5H, pins 1, 2, 3, or 4, a 32V peak-to-peak signal will be produced at the output pin 7. This indicates proper operation of the M5H. This output signal at pin 7 is controllable in width by the Front Panel MARKER WIDTH control. The signal is now routed through the Front Panel Marker Size control and to the Front Panel SCOPE VERTICAL connector. A 12V peak-to-peak signal is normally at this point when the Front Panel SIZE control is set to maximum. A common marker problem is that caused by one of the interconnecting cables between the M6 modules being loose. This causes a notch in the sweep sample input to the module causing uneven harmonics or weak output.

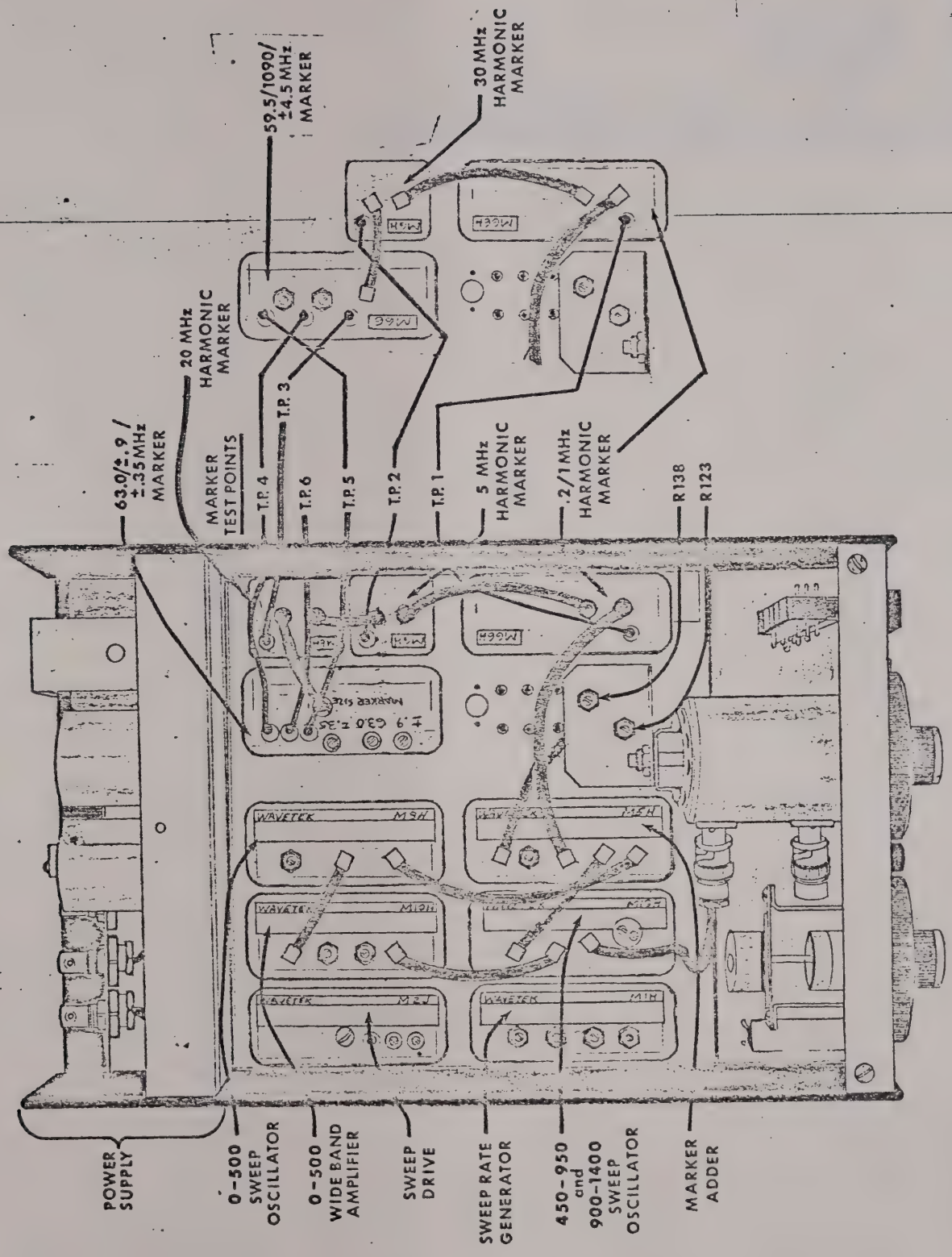


Figure 5-14. Top View

SECTION 6
SCHEMATICS AND PARTS LIST

6.1 INTRODUCTION — This section contains all schematics and a list of replaceable parts for the instrument. Parts lists are located on the reverse side of the associated schematics.

6.2 MANUFACTURER'S CODE — The following code is used on the parts list to identify the manufacturer.

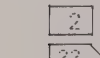
A-B	Allen-Bradley	Milwaukee, Wisconsin
A-E	Arco-Elmenco	Great Neck, New York
AER	Aerovox	New Bedford, Massachusetts
ALC	Alco Electronic Products Inc.	Lawrence, Massachusetts
AMP	AMP, Inc.	Harrisburg, Pennsylvania
APL	Amphenol	Danbury, Conn.
APX	Amperex	Slatersville, R. I.
BEK	Beckman Instruments, Inc.	Fullerton, California
BEL	Belden	Chicago, Illinois
BOU	Bourns	Riverside, California
BUS	Bussman	St. Louis, Missouri
CAM	Cambion	Cambridge, Massachusetts
C-D	Cornell Dubilier	Newark, New Jersey
CGW	Corning Glass Works	Corning, New York
C-J	Cinch Jones	Elk Grove Village, Illinois
C-K	C & K Components	Watertown, Massachusetts
C-L	Centralab	Milwaukee, Wisconsin
CTS	Chicago Telephone Systems	Elkhart, Indiana
C-W	Continental Wire	Philadelphia, Pennsylvania
DIO	Diodes, Inc.	Chatsworth, California
DRA	Drake Mfg. Company	Harwood Heights, Illinois
ETP	Erie Technological Prod. Inc.	Erie, Pennsylvania
FCD	Fairchild	Mountain View, California
G-E	General Electric	Syracuse, New York
G-H	Grayhill	La Grange, Illinois
HHS	Herman H. Smith, Inc.	Brooklyn, New York
H-P	Hewlett-Packard	Palo Alto, California
HEY	Heyman Mfg. Company	Kenilworth, New Jersey
IRC	International Resistance Co.	Philadelphia, Pennsylvania
ITT	International Telephone & Telegraph	West Palm Beach, Florida
JEF	Jeffers	Dubois, Pennsylvania
KID	Kidco, Inc.	Medford, New Jersey
LIT	Littelfuse	Des Plaines, Illinois
MAL	Mallory	Indianapolis, Indiana
M-O	Marko-Oak	Anaheim, California
MOL	Molex	Downers Grove, Illinois
MOT	Motorola	Phoenix, Arizona
P-B	Potter & Brumfield	Princeton, Indiana
POM	Pomona Electronics Co., Inc.	Pomona, California
Q-C	Quality Components	St. Marys, Pennsylvania
RCA	Radio Corporation of America	Harrison, New Jersey

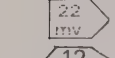
SCHEMATICS & PARTS LIST

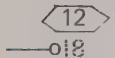
RMC	Radio Material Company	Chicago, Illinois
SCC	Stackpole Carbon Co.	St. Marys, Pennsylvania
SEL	Selectro	Mamaroneck, New York
SEM	Semtech	Newbury Park, California
SIG	Signetics Corporation	Sunnydale, California
S-I	Switchcraft, Inc.	Chicago, Illinois
SPR	Sprague	North Adams, Massachusetts
S-T	Sarkes Tarzian	Bloomington, Indiana
STR	Stettner & Co.	Nurnburg, Western Germany
SYL	Sylvania	Woburn, Massachusetts
THR	Thermalloy, Co.	Dallas, Texas
TRW	TRW Capacitor Division	Ogallala, Nebraska
W-E	Wells Electronics	South Bend, Indiana
W-I	Wavetek, Indiana, Inc.	Indianapolis, Indiana
WSD	Wavetek, San Diego	San Diego, California

6.3 SCHEMATIC NOTES — The following notes and abbreviations pertain to all schematics. Additional notes pertaining to specific schematics are included on each schematic if required.

All resistor values are shown in "ohms" unless otherwise specified.
All capacitor values are shown in picofarads "pF" unless otherwise specified.
All inductor values are shown in microhenries "uH" unless otherwise specified.


Denotes DC voltage reading in volts unless otherwise specified.


Denotes high impedance crystal detector reading in volts unless otherwise specified.


Denotes 50ohm crystal detector reading in volts unless otherwise specified.

Signal or voltage source

Connect to indicate signal or voltage source

Arrow indicates clockwise rotation of wiper

Coaxial jack

Coaxial plug

Coaxial cable

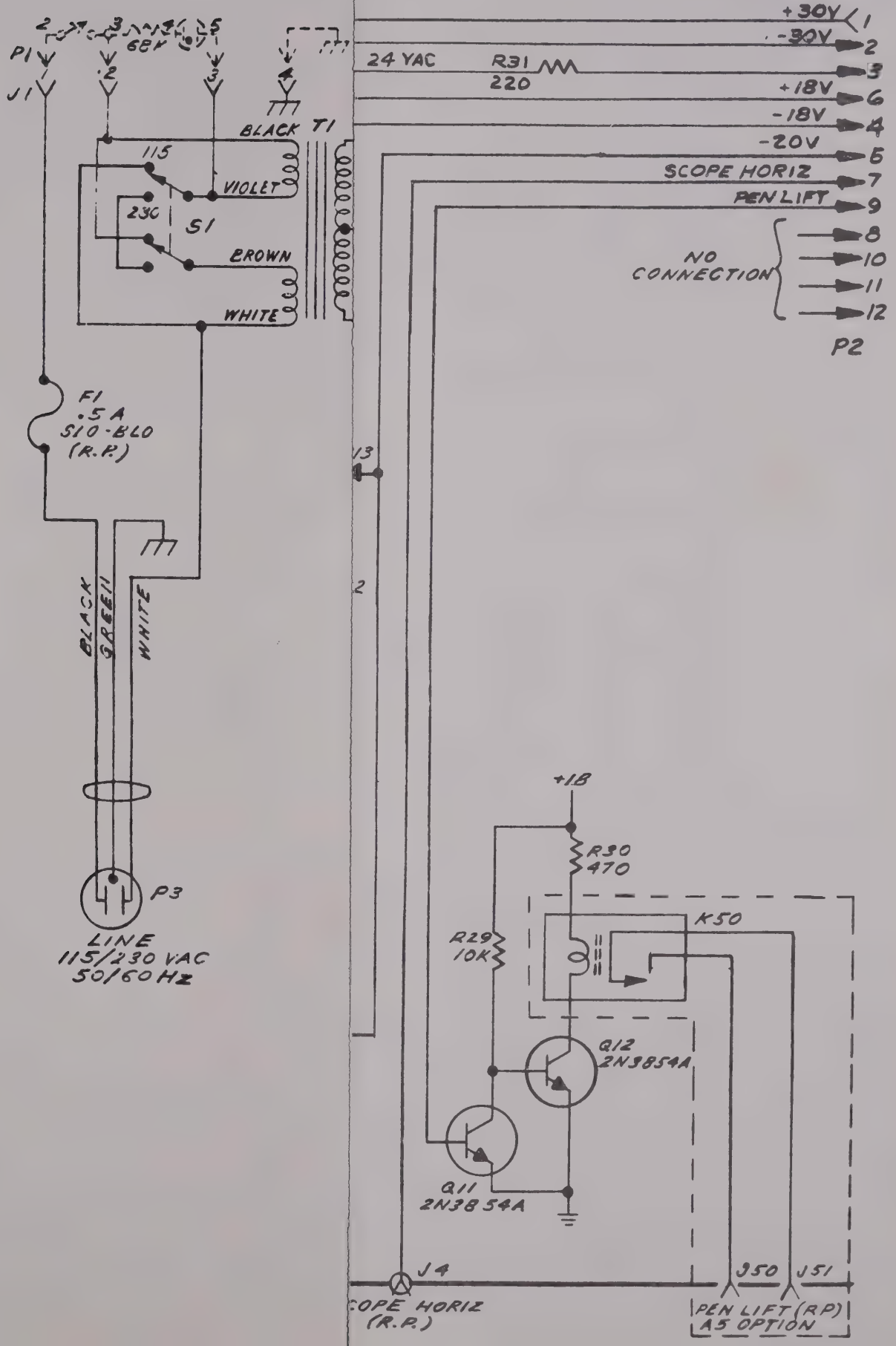
* Factory adjusted part

6.4 ABBREVIATION CODE

A	ampere	IF	intermediate frequency	Ω	ohm
ac	alternating current	kHz	kiloherz	p-p	peak to peak
C	capacitor	Kohm	kilohm	pF	picofarad
CR	diode	kv	kilovolt	Q	transistor
dB	decibel	kW	kilowatt	R	resistor
dBm	decibel referred to 1mW	L	inductor	RF	radio frequency
dc	direct current	MHz	megahertz	rms	root-mean-square
DS	device indicating, lamp	Mohm	megohm	R.P.	rear panel
F	farad	uF	microfarad	S	switch
F.P.	front panel	uA	microampere	T	transformer
H	henry	uH	microhenry	V	volt
Har	harmonic	mA	milliampere	VA	voltampere
Hz	hertz	mH	millihenry	W	watt
IC	integrated circuit	mV	millivolt	X	crystal
		mW	milliwatt		

TIC, PS6 POWER SUPPLY

REV. D



SCHEMATICS & PARTS LIST

RMC	Radio Material Company	Chicago, Illinois
SCC	Stackpole Carbon Co.	St. Marys, Pennsylvania
SEL	Selectro	Mamaroneck, New York
SEM	Semtech	Newbury Park, California
SIG	Signetics Corporation	Sunnydale, California
S-I	Switchcraft, Inc.	Chicago, Illinois
SPR	Sprague	North Adams, Massachusetts
S-T	Sarkes Tarzian	Bloomington, Indiana
STR	Stettner & Co.	Nurnburg, Western Germany
SYL	Sylvania	Woburn, Massachusetts
THR	Thermalloy, Co.	Dallas, Texas
TRW	TRW Capacitor Division	Ogallala, Nebraska
W-E	Wells Electronics	South Bend, Indiana
W-I	Wavetek, Indiana, Inc.	Indianapolis, Indiana
WSD	Wavetek, San Diego	San Diego, California

6.3 SCHEMATIC NOTES — The following notes and abbreviations pertain to all schematics. Additional notes pertaining to specific schematics are included on each schematic if required.

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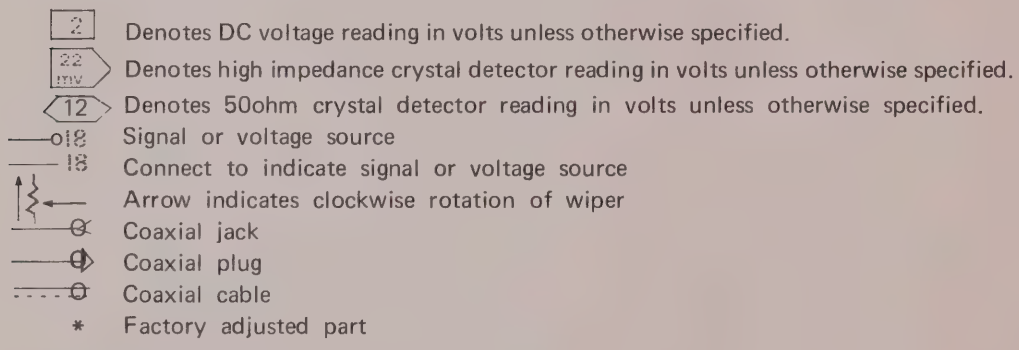
All capacitor values are shown in picofarads "pF" unless otherwise specified.
All inductor values are shown in microhenries "uH" unless otherwise specified.



Denotes DC voltage reading in volts unless otherwise specified.
Denotes high impedance crystal detector reading in volts unless otherwise specified.
Denotes 50ohm crystal detector reading in volts unless otherwise specified.
Signal or voltage source
Connect to indicate signal or voltage source
Arrow indicates clockwise rotation of wiper
Coaxial jack
Coaxial plug
Coaxial cable
* Factory adjusted part

6.4 ABBREVIATION CODE

A	ampere	IF	intermediate frequency	Ω	ohm
ac	alternating current	kHz	kiloherz	p-p	peak to peak
C	capacitor	Kohm	kilohm	pF	picofarad
CR	diode	kv	kilovolt	Q	transistor
dB	decibel	kW	kilowatt	R	resistor
dBm	decibel referred to 1mW	L	inductor	RF	radio frequency
dc	direct current	MHz	megahertz	rms	root-mean-square
DS	device indicating, lamp	Mohm	megohm	R.P.	rear panel
F	farad	uF	microfarad	S	switch
F.P.	front panel	uA	microampere	T	transformer
H	henry	uH	microhenry	V	volt
Har	harmonic	mA	milliampere	VA	voltampere
Hz	hertz	mH	millihenry	W	watt
IC	integrated circuit	mV	millivolt	X	crystal
		mW	milliwatt		

SCHEMATIC, PS6 POWER SUPPLY

REV. D

P1 J1 2 3 4 5 6 7 68V 115 230 S1 BLACK VIOLET BROWN WHITE T1 RED YELLOW/RED YELLOW CR1 CR2 CR3 CR4 C1 1250μF C2 50μF C3 100μF C4 100 C5 .005μF C6 100μF C7 1250μF C8 120 C9 10μF C10 100μF C11 100μF C12 100 R1 270 R2 1.8K R3 5 R4 1K R5 12.1K R6 1.5K R7 220 R8 3.9K R9 1K +18V ADJ R10 2.7K R11 5 R12 470 R13 2.7K R14 1K R15 15K R17 1K R18 4.7K R19 10K R20 10K R21 1K R22 5 R23 10K R24 15K R25 470 R26 2.2K R27 825 R28 6.81K R30 470 R29 10K R31 220 IC1 723C IC2 741C Q1 2N3644 Q2 2N5294 Q3 2N5294 Q4 2N3644 Q5 2N3644 Q6 2N3854A Q7 2N3854A Q8 2N5294 Q9 2N3644 Q10 2N3644 Q11 2N3854A Q12 2N3854A CR5 CR6 CR7 CR8 CR9 CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR17 K50 F1 .5A SLO-BLO (R.P.) BLACK GREEN WHITE P3 LINE 115/230 VAC 50/60 Hz 24 VAC +18 -18 +30V -30V +18V -18V -20V SCOPE HORIZ PEN LIFT NO CONNECTION P2 J4 SCOPE HORIZ (R.P.) J50 J51 PEN LIFT (R.P.) AS OPTION

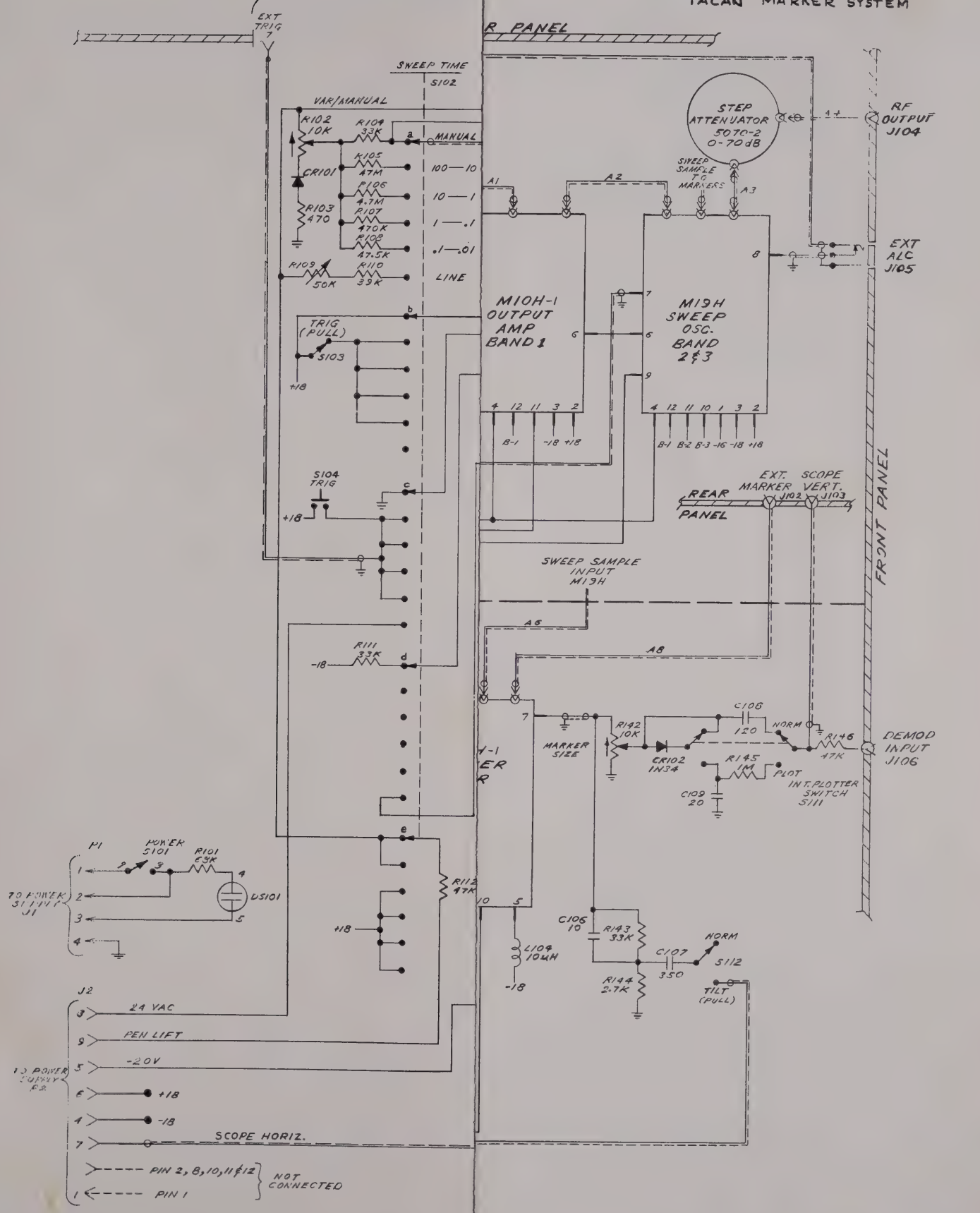
PARTS LIST PS6 POWER SUPPLY REV. D

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"Q "	TRANSISTORS				
1,4,5,9,10	PNP, Silicon	QA036-440	FCD	2N3644	5
2,3,8	NPN, Silicon	QA052-940	RCA	2N5294	3
6,7,11,12	NPN, Silicon	QA038-541	G-E	2N3854A	4
----------	PARTS MOUNTED ON CHASSIS, AND MISCELLANEOUS PARTS	----------			
"J "	CONNECTORS (JACKS)				
1	4-pin receptacle	MC000-034	MOL	1625-4R-1	1
----	Contact, female, for above	MC000-018	MOL	1855	4
4	BNC, receptacle	JB109-111	APL	UG911A/I	1
"P "	CONNECTORS (PLUG)				
3	AC Plug/cord assembly (USA-Canada)	WL002-088	BEL	17237	1
	AC Plug/cord assembly (Western Europe)	WL007-088	BEL		
"F "	FUSES				
1	.5 Amp., slo-blo (used with 115Vac line)	MF000-007	BUS	MDV½	1
	.25Amp., slo-blo (used with 230Vac line)	MF000-006	BUS	MDV¼	--
	Fuse holder, for above	MF000-001	BUS	HMM	1
"S "	SWITCHES				
1	DPDT, slide, power change	SS000-003	S-I	46256LFE	1
	MISCELLANEOUS				
	Bushing, strain relief	HB004-000	HEY	SR5P1	1
	10 lead, TO-5 pad	HQ103-000	THR	7717-21DAP	1
	Insulated sholder washer	HW110-400	RCA	DF137A	3
	Transistor mtg. insulator, mica	HQ101-003	W-I	HQ101-003	3
----------	PARTS FOR PEN LIFT OPTION A5	----------			
"J "	CONNECTORS (JACKS)				
50,51	Binding post, miniature, .104ID (mates with wire, or banana plug)	MC000-038	POM	2439	2
"K "	RELAYS				
50	SPST, N.O. 12V	MR000-001	P-B	JRM1006	1

MODULE WIRING DIAGRAM
2001A HEAD

REV. _____

TACAN MARKER SYSTEM



PARTS LIST PS6 POWER SUPPLY REV. D

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
	----------PARTS MOUNTED ON PRINTED CIRCUIT BOARD----------				
"C "	CAPACITORS				
1,7	Electrolytic, 1250uF, 50V	CE114-212	SPR	PCL-1339	2
2	Electrolytic, 50uF, 50V	CE107-050	SPR	TE1307	1
3,6,10,11	Electrolytic, 100uF, 25V	CE105-110	SPR	TE1211	4
4,12	Ceramic disc., 100pF ±20% 1kV	CD102-110	SPR	5GA-T10	2
5	Ceramic disc., .005uF ±20%	CD103-250	SPR	TG-D50	1
8	Ceramic disc., 120pF ±20% 1kV	CD102-112	SPR	5GA-T12	1
9	Electrolytic, 10uF, 25V	CE105-010	SPR	TE1204	1
"P "	CONNECTORS (PLUGS)				
2	12-pin printed circuit	MC000-031	MOL	03-04-4121	1
"CR "	DIODES				
1 to 17	Silicon, junction, 100piV, 3/4A	DR000-001	ITT	1N4002	17
"IC "	INTEGRATED CIRCUITS				
1	Voltage Regulator, 10 pin TO-5	IC000-001	FCD	U5R7723393	1
2	Operational amplifier, 8 pin in line	IC000-002	SIG	N5741V	1
"R "	RESISTORS				
1	Fixed, comp., 270ohm ±10% ¼W	RC104-127	A-B	CB2711	1
2	Fixed, comp., 1.8k ±10% ¼W	RC104-218	A-B	CB1821	1
3,11,22	Fixed, deposited carb., 5ohm ±1% ½W	RD0R-050	K1D	K-C½	3
4,14,21	Fixed, deposited carb. 1k ±1% ¼W	RD011-100	COR	RN60D	3
5	Fixed, deposited carb., 12.1k ±1% ¼W	RD012-121	COR	RN60D	1
6	Fixed, comp., 1.5k ±10% ¼W	RC104-215	A-B	CB1521	1
7	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	1
8	Fixed, comp., 3.9k ±5% ¼W	RC103-239	A-B	CB3925	1
9	Variable, cermet, 1k ±20%	RP131-210	CTS	360T102B	1
10	Fixed, comp., 2.7k ±5% ¼W	RC103-227	A-B	CB2725	1
12,25	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	2
13	Fixed, comp., 2.7k ±10% ½W	RC106-227	A-B	EB2721	1
15,24	Fixed, deposited carb., 15k ±1% ¼W	RD012-150	COR	RN60D	2
16,17	Fixed, comp., 1k ±10% ¼W	RC104-210	A-B	CB1021	2
18	Fixed, comp., 4.7k ±10% ¼W	RC104-247	A-B	CB4721	1
19,20	Dep. carb., 10k, matched set, ±.1%	RX000-003	W-I	RX000-003	1
23,29	Fixed, comp., 10k ±10% ¼W	RC104-310	A-B	CB1031	2
26	Fixed, comp., 2.2k ±10% ½W	RC106-222	A-B	EB2221	1
27	Fixed, deposited carb., 825ohm ±1% ¼W	RD010-825	COR	RN60D	1
28	Fixed, deposited carb., 6.81k ±1% ¼W	RD011-681	COR	RN60D	1
30	Fixed, comp., 470ohm ±10% ½W	RC106-147	A-B	EB4711	1
31	Fixed, comp., 220ohm ±10% ½W	RC106-122	A-B	EB2211	1
"T "	TRANSFORMERS				
1	115/230 X 48 Vac, center tapped	TT000-022	W-I	TT000-022	1

PARTS LIST PS6 POWER SUPPLY REV. D

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"Q "	TRANSISTORS				
1,4,5,9,10	PNP, Silicon	QA036-440	FCD	2N3644	5
2,3,8	NPN, Silicon	QA052-940	RCA	2N5294	3
6,7,11,12	NPN, Silicon	QA038-541	G-E	2N3854A	4
	---------- PARTS MOUNTED ON CHASSIS, AND MISCELLANEOUS PARTS----------				
"J "	CONNECTORS (JACKS)				
1	4-pin receptacle	MC000-034	MOL	1625-4R-1	1
----	Contact, female, for above	MC000-018	MOL	1855	4
4	BNC, receptacle	JB109-111	APL	UG911A/I	1
"P "	CONNECTORS (PLUG)				
3	AC Plug/cord assembly (USA-Canada)	WL002-088	BEL	17237	1
	AC Plug/cord assembly (Western Europe)	WL007-088	BEL		
"F "	FUSES				
1	.5 Amp., slo-blo (used with 115Vac line)	MF000-007	BUS	MDV½	1
	.25Amp., slo-blo (used with 230Vac line)	MF000-006	BUS	MDV¼	--
	Fuse holder, for above	MF000-001	BUS	HMM	1
"S "	SWITCHES				
1	DPDT, slide, power change	SS000-003	S-I	46256LFE	1
	MISCELLANEOUS				
	Bushing, strain relief	HB004-000	HEY	SR5P1	1
	10 lead, TO-5 pad	HQ103-000	THR	7717-21DAP	1
	Insulated sholder washer	HW110-400	RCA	DF137A	3
	Transistor mtg. insulator, mica	HQ101-003	W-I	HQ101-003	3
	---------- PARTS FOR PEN LIFT OPTION A5 ----------				
"J "	CONNECTORS (JACKS)				
50,51	Binding post, miniature, .104ID (mates with wire, or banana plug)	MC000-038	POM	2439	2
"K "	RELAYS				
50	SPST, N.O. 12V	MR000-001	P-B	JRM1006	1

MODULE WIRING DIAGRAM 2001A HEAD

REV.____

TACAN MARKER SYSTEM

REMOTE JACK J101

REMOTE PLUG P101

REAR PANEL

FRONT PANEL

EXT TRIG

SWEEP TIME S102

VAR/MANUAL

R102 10K

R104 33K

MANUAL

R113 39K

R114 75K

R105 47M

R106 4.7M

R107 470K

R108 47.5K

R109 50K

R110 33K

CR101

R103 470

100—10

10—1

1—.1

.1—.01

LINE

M1H SWEEP RATE

TRIG (PULL) S103

S104 TRIG

R111 27K

SWEEP WIDTH

R115 10K

R116 47K

S106 500

R118 39K

100

R119 10K

10

R117 1K

S105 CW

R120 10K FREQ. (COARSE)

R121 10K FREQ. (FINE)

R122 20K LEVEL

R123 20K

R124 4.7K

R125 8.06K

R126 10.0K

IC 101 741

SWEEP SAMPLE TO MARKERS

M2J SWEEP DRIVE

M9H SWEEP OSC. BAND1

A1 TO M10H

S107 ATTENUATOR 0-11dB

C101 .01µF

IC 102 741

R140 10M

R127 215

R128 191

R129 174

R130 154

R131 137

R132 121

R133 110

R134 95.3

R135 86.6

R136 78.7

R137 68.1

R138 1K

R139 220

M10H-1 OUTPUT AMP BAND 1

M13H SWEEP OSC. BAND 2&3

STEP ATTENUATOR 5070-2 0-70dB

RF OUTPUT J104

EXT ALC J105

EXT. SCOPE MARKER VERT. J102 J103

BLANKING

SWEEP DRIVE

SWEEP SAMPLE INPUT M9H

SWEEP SAMPLE INPUT M13H

RF MARKERS

A11 A10 A9 A7 A6 A5 A8

M66 63.0 ±.9 ±3.5

M6H-1 20

M6H-1 5

M66H-1 1 .2

M5H-1 MARKER ADDER

S109

L101 10mH

L102 10mH

C102 .002µF

C103 .02µF

C104 68

C105 150

R141 2.2K

WIDE

NARROW

MARKER WIDTH S110

L103 10µH

L104 10µH

MARKER SIZE

R142 10K

CR102 IN34

C106 120

NORM

R146 47K

R145 1M

C109 20

PLOT INT. PLOTTER SWITCH S111

DEMOD INPUT J106

C105 10

R143 33K

C107 350

R144 2.7K

NORM S112

TILT (PULL)

BAND S108

1-500 MHz

450-950MHz

900-1400MHz

B-1 B-2 B-3 -20

M1 POWER S101 P101 R112 47K US101

J1 70 V 2W 7K 31 FIN 7

J2

24 VAC

PEN LIFT

-20V

13 POWER SUPPLY P2

+18

-18

SCOPE HORIZ.

PIN 2, 8, 10, 11 & 12 NOT CONNECTED

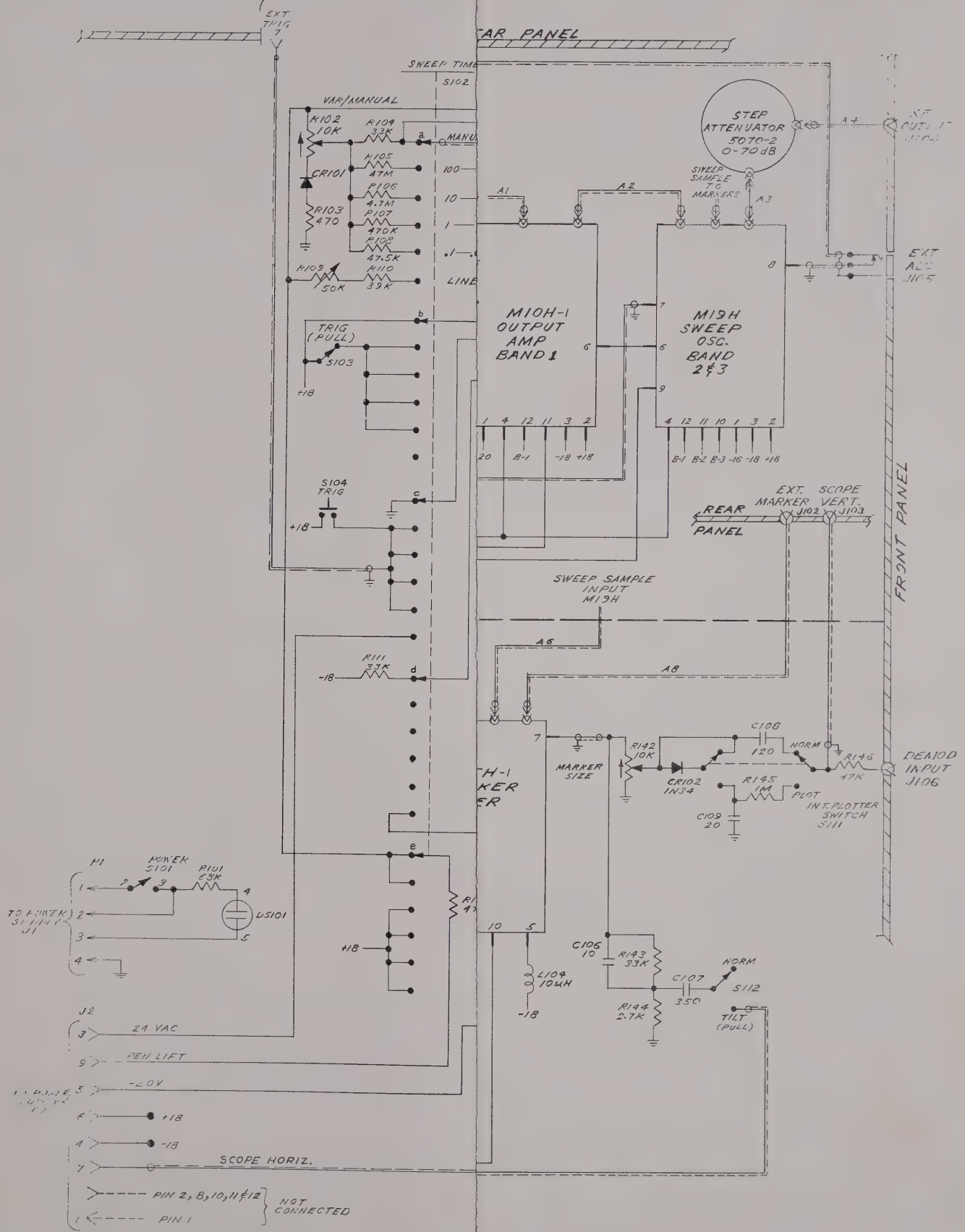
PIN 1

PARTS LIST MODULE REV

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER		TQ
			CODE	NUMBER	
	SEE STANDARD 2001A HEAD PARTS LIST FOR SHEET 2 and 3				

MODULE WIRING DIAGRAM
2001A HEAD

REV. A



PARTS LIST MODEL 2001A HEAD with TACAN Markers — MODULE — REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
	STANDARD MODULES				
M1H	Sweep Rate Module	M1H	W-I	M1H	1
M2J	Sweep Drive Module	M2J	W-I	M2J	1
M5H-1	Marker Adder Module (modified)	M5H-1	W-I	M5H-1	1
M10H-1	Output Amplifier Module, Band 1(modified)	M10H-1	W-I	M10H-1	1
M19H	Oscillator Module, Band 2 & 3	M19H	W-I	M19H	1
M66H.2,1	Harmonic Markers, 200kHz, 1 MHz,(modified)	M66H.2,1-1	W-I	M66H.2,1-1	1
M6H5	Harmonic Markers, 5 MHz, (modified)	M6H5-1	W-I	M6H5-1	1
M6H20	Harmonic Markers, 20 MHz (modified)	M6H20-1	W-I	M6H20-1	1
M66 63.0	Single frequency marker at 63.0 MHz with sidebands at 62.1 MHz and 63.9 MHz and a 62.65 and 63.35 MHz	M66 63.0	W-I	M66 63.0	1
"A"	ASSEMBLIES				
1	RF Cable, 50 ohm	WX2001A-A1	W-I	WX2001A-A1	1
2	RF Cable, 50 ohm	WX2001A-A2	W-I	WX2001A-A2	1
3	RF Cable, 50 ohm	WX2001A-A3	W-I	WX2001A-A3	1
4	RF Cable, 50 ohm	WX2001A-A4	W-I	WX2001A-A4	1
5	RF Cable, 50 ohm	WX2001A-A5	W-I	WX2001A-A5	1
6	RF Cable, 50 ohm	WX2001A-A6	W-I	WX2001A-A6	1
7	RF Cable, 50 ohm	WX2001A-A7	W-I	WX2001A-A7	1
8	RF Cable, 50 ohm	WX2001A-A8	W-I	WX2001A-A8	1
9	RF Cable, 50 ohm	WX2001A-A9	W-I	WX2001A-A9	1
10	RF Cable, 50 ohm	WX2001A-A10	W-I	WX2001A-A10	1
11	RF Cable, 50 ohm	WX2001A-A11	W-I	WX2001A-A11	1
----	S102 Assembly with associated parts	B500-225	W-I	B500-225	1
----	S107 Assembly with associated parts	B500-232	W-I	B500-232	1
----	S108 Assembly with associated parts	B500-224	W-I	B500-224	1
5070-2	RF Attenuator	5070-2	W-I	5070-2	1
"C"	CAPACITORS				
101	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	1
102	Ceramic disc, .002uF ±20% 1kV	CD102-220	SPR	5GA-D20	1
103	Ceramic disc, .02uF ±20% 100V	CD103-320	SPR	TG-S20	1
104	Ceramic disc, 68pF ±5% 1kV	CD104-068	SPR	10TCU-Q68	1
105	Ceramic disc, 150pF ±20% 1kV	CD102-115	SPR	5GA-T15	1
106	Ceramic disc, 10pF ±5% 1kV	CD101-010	SPR	10TCC-Q10	1
107	Ceramic disc, 350pF ±20% 1kV	CD102-135	SPR	5GA-T35	1
108	Ceramic disc, 120pF ±20% 1kV	CD102-112	SPR	5GA-T12	1
109	Ceramic disc, 20pF ±5% 1kV	CD101-020	SPR	10TCC-Q20	1
"J"	CONNECTORS (JACKS)				
2	12-pin receptacle	MC000-030	MOL	1360-R1	1
	Contact, female, for above	MC000-032	MOL	1433	6
	Contact, male, for above	MC000-033	MOL	1434	1
101	15-pin receptacle	MC000-016	MOL	1625-15R	1
	Contact, female, for above	MC000-018	MOL	1855	14
102,103,104	BNC, Cable	JB000-003	W-I	JB000-003	3
105	Phone, receptacle, submin.	MC000-036	S-I	142A	1

PARTS LIST — MODULE — REV

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
	SEE STANDARD 2001A HEAD PARTS LIST FOR SHEET 2 and 3				

MODULE WIRING DIAGRAM
2001A HEAD

REV. A

REMOTE JACK J101

REMOTE PLUG P101

REAR PANEL

FRONT PANEL

SWEEP TIME S102

VAR/MANUAL

R102 10K

R104 33K

R105 47M

R106 4.7M

R107 470K

R108 47.5K

R109 150K

R110 33K

R103 470

CR101

MANUAL

100 — 10

10 — 1

1 — .1

.1 — .01

LINE

R113 39K

R114 75K

+18

M1H SWEEP RATE

TRIG (PULL) S103

S104 TRIG

R111 33K

-18

SWEEP WIDTH

R115 10K

R116 47K

S106 500

R118 39K

100

R119 10K

10

R117 1K

S105 CW

R120 10K FREQ. (COARSE)

R121 10K FREQ. (FINE)

+16 -16

M2J SWEEP DRIVE

B-1 B-2 B-3 -18 +18

R122 20K LEVEL

R147 15K

R123 20K

R124 4.7K

R125 8.06K

R126 10.0K

IC 101 741

SWEEP SAMPLE TO MARKERS

A1 TO M10H

M9H SWEEP OSC. BAND1

S107 ATTENUATOR 0-11dB

C101 .01

R140 10M

IC 102 741

R127 215

R129 191

R128 174

R130 154

R131 137

R132 121

R133 110

R134 95.3

R135 86.6

R136 78.7

R137 68.1

R138 1K

R139 220

STEP ATTENUATOR 5070-2 0-70dB

TO M9H

A1

A2

A3

SWEEP SAMPLE TO MARKERS

M10H-1 OUTPUT AMP BAND 1

M19H SWEEP OSC. BAND 2&3

EXT ALC INPUT

EXT SCOPE MARKER VERT. J103

J102

BLANKING

SWEEP DRIVE

SWEEP SAMPLE INPUT M9H

SWEEP SAMPLE INPUT M19H

RF MARKERS

A5

A6

A7

A8

A9

A10

M66

M6H-1

M66H-1

M5H-1 MARKER ADDER

S109

L101 10mH

L102 10mH

C102 .002uF

C103 .02uF

C104 68

C105 150

R141 2.2K

WIDE

NARROW

MARKER WIDTH S110

L103 10uH

L104 10uH

MARKER SIZE

R142 10K

CR102 IN34

C106 10

R143 33K

C107 350

R144 2.7K

NORM

S112

TILT (PULL)

C108 120

R145 1M

PILOT

INTERPLOTTER SWITCH S111

C109 20

R146 470

READOUT INPUT J106

BAND S108

1-500 MHz

450-950MHz

900-1400MHz

B-1 B-2 B-3 -20

P1

HOWER S101

P101 2.5K

US101

R112 47K

J2

24 VAC

PEN LIFT

-20V

+18

-18

SCOPE HORIZ.

PIN 2, 8, 10, 11 & 12 NOT CONNECTED

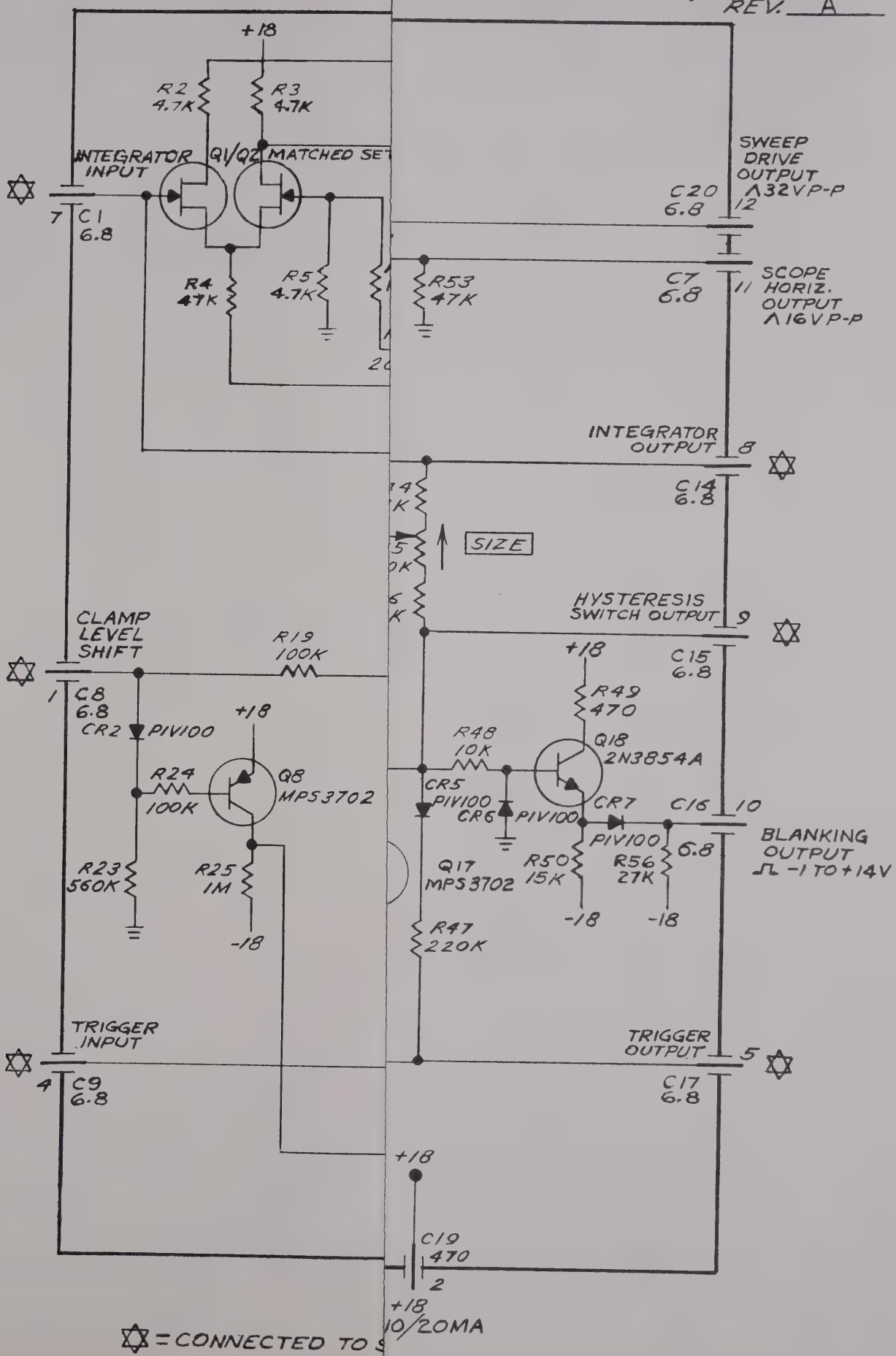
PIN 1

	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
	JB-109-111	APL	UG911A/U	1
	MC-000-002	W-I	MC-000-002	--
	MC-000-035	MOL	1625-4P1	1
	MC-000-019	MOL	1854	4
	MC-000-017	MOL	1625-15P	1
	MC-000-019	MOL	1854	8
	DR-000-001	ITT	1N4002	1
	DG-100-341	SYL	1N34AS	1
	MB-000-002	M-O	A1H	1
	LA-104-310	JEF	15S	2
	LA-101-010	JEF	15	2
-5	IC-000-004	SIG	N5741T	2
	RC-104-368	A-B	CB6831	1
assembly	----------	---	----------	--
	RC-103-147	A-B	CB4715	1
	RC-103-333	A-B	CB3335	2
	RC-103-647	A-B	CB4765	1
	RC-103-547	A-B	CB4755	1
	RC-103-447	A-B	CB4745	1
1% ¼W	RD-012-475	COR	RN60D	1
1W	RP-129-350	CTS	360S503B	1
	RC-103-339	A-B	CB3935	3
	RC-103-347	A-B	CB4735	2
	RC-103-375	A-B	CB7535	1
	RP-132-310	W-I	RP-132-310	1
	RC-103-210	A-B	CB1025	1
	RC-103-310	A-B	CB1035	1
	RP-900-004	W-I	RP-900-004	1
	RP-123-310	W-I	RP-123-310	1
	RP-124-320	A-B	WA2G032	2
	RC-104-247	A-B	CB4721	1
¼W	RF-21-3100	COR	C-4	1
% ¼W	RF-21-2806	COR	C-4	1
¼W	RF-21-1215	COR	C-4	1
¼W	RF-21-1191	COR	C-4	1

PARTS LIST MODEL 2001A HEAD

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
129	Fixed, metal film 174 ohm ±1% ¼W	RF-21-1174	COR	C-4	1
130	Fixed, metal film 154 ohm ±1% ¼W	RF-21-1154	COR	C-4	1
131	Fixed, metal film 137 ohm ±1% ¼W	RF-21-1137	COR	C-4	1
132	Fixed, metal film 121 ohm ±1% ¼W	RF-21-1121	COR	C-4	1
133	Fixed, metal film 110 ohm ±1% ¼W	RF-21-1110	COR	C-4	1
134	Fixed, metal film 95.3 ohm ±1% ¼W	RF-21-0953	COR	C-4	1
135	Fixed, metal film 86.6 ohm ±1% ¼W	RF-21-0866	COR	C-4	1
136	Fixed, metal film 78.7 ohm ±1% ¼W	RF-21-0787	COR	C-4	1
137	Fixed, metal film 68.1 ohm ±1% ¼W	RF-21-0681	COR	C-4	1
138	Variable, carbon, 1k ohm	RP-133-210	A-B	WA2G056	1
139	Fixed, comp., 220 ohm ±10% ¼W	RC-104-122	A-B	CB2211	1
140	Fixed, comp., 10M ohm ±10% ¼W	RC-104-610	A-B	CB1061	1
141	Fixed, comp., 2.2k ohm ±10% ¼W	RC-104-222	A-B	CB2221	1
142	Variable, carbon, 10k ohm, part of S108	----------	---	---------	--
143	Fixed, comp., 33k ohm ±10% ¼W	RC-104-333	A-B	CB3331	1
144	Fixed, comp., 2.7k ohm ±10% ¼W	RC-104-227	A-B	CB2721	1
145	Fixed, comp., 1M ohm ±10% ¼W	RC-104-510	A-B	CB1051	1
146	Fixed, comp., 47k ohm ±10% ¼W	RC-104-347	A-B	CB4731	1
147	Fixed, comp., 15k ohm ± 10% ¼W	RC-104-315	A-B	CB1531	1
"S "	SWITCHES				
101	SPDT, Push/Push illuminated	SZ-000-003	M-O	54-6169126	1
102	Rotary, 6-pole, 6-position, assembly	SR-000-019	W-I	SR-000-019	1
103	SPST, Push on, (part of S102 assembly)	----------	----	----------	--
104	Momentary contact N.O. submin.	SM-000-004	G-H	39-1	1
105	DPST, Rotary, (part of R115)	----------	---	----------	--
106	2-pole, 3-position slide, submin.	SS-000-004	C-W	G128	1
107	Rotary, 1-pole, 12-position assembly	SR-000-021	W-I	SR-000-021	1
108	Rotary, 6-pole, 3-position	SR-000-020	OAK	399646-512	1
109	Push button switch assembly	SZ-000-011	C-L	PB10 7Sta	1
110	Rotary, 6-pole, 4-position assembly	SR-000-018	W-I	SR-000-018	1
111	DPDT, Slide, Subminiature	SS-000-001	C-W	G126	1
112	SPST, Push-off (part of S109 assembly)	----------	----	----------	1
SEE Fig. 3-2	MISCELLANEOUS MECHANICAL				
1,4	Knob, ½" dia. with pointer	KK-000-020	BUK	PS50PL-1	2
2	Knob, must be calibrated	----------	---	---------	1
2	Knob, 7/8" dia. and cap	KK-300-761	W-I	KK-300-761	1
3	Knob, engraved with 0-7(0) dB	KK-319-102	W-I	KK-319-102	1
3	Knob, with 0-11 dB, engraved skirt	KK-309-101	W-I	KK-309-101	1
5	Push button, black, plain	SZ-000-007	C-L	J52304B	-
8,10	Knob, 7/8" dia.	KW-130-309	WSD	130-309	2
8,10	Knob,	KK-300-762	W-I	KK-300-762	2
9	Knob, 7/8" dia.	KW-130-314	WSD	130-314	1

/EEP RATE SCHEMATIC
MODULE MIH REV. A



PARTS LIST MODEL 2001A HEAD REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
	STANDARD MODULES				
M1H	Sweep Rate Module	M1H	W-I	M1H	1
M2J	Sweep Drive Module	M2J	W-I	M2J	1
M5H-1	Marker Adder Module (modified)	M5H-1	W-I	M5H-1	1
M9H	Oscillator/Mixer Module, Band 1	M9H	W-I	M9H	1
M10H-1	Output Amplifier Module, Band 1(modified)	M10H-1	W-I	M10H-1	1
M19H	Oscillator Module, Band 2 & 3	M19H	W-I	M19H	1
M66H.2,1	Harmonic Markers, 200kHz, 1MHz,(modified)	M66H.2,1 -1	W-I	M66H.2,1 -1	1
M6H30	Harmonic Markers, 30MHz,(modified)	M6H30 -1	W-I	M6H30 -1	1
M66	Single frequency markers at 59.5MHz, with side bands at 55 and 64 MHz, and at 1090MHz with side bands at 1085.5 and 1094.5 MHz	M66	W-I	M66	1
"A "	ASSEMBLIES				
1	RF Cable, 50 ohm	WX2001A-A1	W-I	WX2001A-A1	1
2	RF Cable, 50 ohm	WX2001A-A2	W-I	WX2001A-A2	1
3	RF Cable, 50 ohm	WX2001A-A3	W-I	WX2001A-A3	1
4	RF Cable, 50 ohm	WX2001A-A4	W-I	WX2001A-A4	1
5	RF Cable, 50 ohm	WX2001A-A5	W-I	WX2001A-A5	1
6	RF Cable, 50 ohm	WX2001A-A6	W-I	WX2001A-A6	1
7	RF Cable, 50 ohm	WX2001A-A7	W-I	WX2001A-A7	1
8	RF Cable, 50 ohm	WX2001A-A8	W-I	WX2001A-A8	1
9	RF Cable, 50 ohm	WX2001A-A9	W-I	WX2001A-A9	1
10	RF Cable, 50 ohm	WX2001A-A10	W-I	WX2001A-A10	1
-----	S102 Assembly with associated parts	B-500-225	W-I	B-500-225	1
-----	S107 Assembly with associated parts	B-500-232	W-I	B-500-232	1
-----	S108 Assembly with associated parts	B-500-224	W-I	B-500-224	1
5070-2	RF Attenuator	5070-2	W-I	5070-2	1
"C "	CAPACITORS				
101	Ceramic disc, .01uF ±20% 100V	CD-103-310	SPR	TG-S10	1
102	Ceramic disc, .002uF ±20% 1kV	CD-102-220	SPR	5GA-D20	1
103	Ceramic disc, .02uF ±20% 100V	CD-103-320	SPR	TG-S20	1
104	Ceramic disc, 68pF ±5% 1kV	CD-104-068	SPR	10TCU-Q68	1
105	Ceramic disc, 150pF ±20% 1kV	CD-102-115	SPR	5GA-T15	1
106	Ceramic disc, 10pF ±5% 1kV	CD-101-010	SPR	10TCC-Q10	1
107	Ceramic disc, 350pF ±20% 1kV	CD-102-135	SPR	5GA-T35	1
108	Cermaic disc, 120pF ±20% 1kV	CD-102-112	SPR	5GA-T12	1
109	Ceramic disc, 20pF ±5% 1kV	CD-101-020	SPR	10TCC-Q20	1
"J "	CONNECTORS (JACKS)				
2	12-pin receptacle	MC-000-030	MOL	1360-R1	1
	Contact, female, for above	MC-000-032	MOL	1433	6
	Contact, male, for above	MC-000-033	MOL	1434	1
101	15-pin receptacle	MC-000-016	MOL	1625-15R	1
	Contact, female, for above	MC-000-018	MOL	1855	14
102,103,104	BNC, Cable	JB-000-003	W-I	JB-000-003	3
105	Phone, receptacle, submin.	MC-000-036	S-I	142A	1

PARTS LIST MODEL 2001A HEAD REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"J "	CONNECTORS (JACKS)				
106	BNC, receptacle	JB-109-111	APL	UG911A/U	1
-----	Pin Socket, Teflon	MC-000-002	W-I	MC-000-002	--
"P "	CONNECTORS (PLUGS)				
1	4-pin	MC-000-035	MOL	1625-4P1	1
	Contact, male for above	MC-000-019	MOL	1854	4
101	15-pin	MC-000-017	MOL	1625-15P	1
	Contact, male for above	MC-000-019	MOL	1854	8
"CR "	DIODES				
101	Silicon, Juction, 100piV 750mA	DR-000-001	ITT	1N4002	1
102	Germanium, Point contact	DG-100-341	SYL	1N34AS	1
"DS "	LAMPS				
101	Indicator, Neon, Part of S101	MB-000-002	M-O	A1H	1
"L "	INDUCTORS				
101,102	Fixed, 10mH	LA-104-310	JEF	15S	2
103,104	Fixed, 10uH	LA-101-010	JEF	15	2
"IC "	INTEGRATED CIRCUITS				
101,102	Operational amplifier, 8 lead TO-5	IC-000-004	SIG	N5741T	2
"R "	RESISTORS				
101	Fixed, comp., 68k ohm ±10% ¼W	RC-104-368	A-B	CB6831	1
102	Variable, 10k ohm, part of S102 assembly	----------	---	----------	--
103	Fixed, comp., 470 ohm ±5% ¼W	RC-103-147	A-B	CB4715	1
104,111	Fixed, comp., 33k ohm ±5% ¼W	RC-103-333	A-B	CB3335	2
105	Fixed, comp., 47M ohm ±5% ¼W	RC-103-647	A-B	CB4765	1
106	Fixed, comp., 4.7M ohm ±5% ¼W	RC-103-547	A-B	CB4755	1
107	Fixed, comp., 470k ohm ±5% ¼W	RC-103-447	A-B	CB4745	1
108	Fixed, dep. carbon, 47.5k ohm ±1% ¼W	RD-012-475	COR	RN60D	1
109	Variable, cermet, 50k ohm ±20% 1W	RP-129-350	CTS	360S503B	1
110,113,118	Fixed, comp., 39k ohm ±5% ¼W	RC-103-339	A-B	CB3935	3
112,116	Fixed, comp., 47k ohm ±5% ¼W	RC-103-347	A-B	CB4735	2
114	Fixed, comp., 75k ohm ±5% ¼W	RC-103-375	A-B	CB7535	1
115	Variable, carbon, 10k ohm	RP-132-310	W-I	RP-132-310	1
117	Fixed, comp., 1k ohm ±5% ¼W	RC-103-210	A-B	CB1025	1
119	Fixed, comp., 10k ohm ±5% ¼W	RC-103-310	A-B	CB1035	1
120	Variable, carbon, 10k ohm	RP-900-004	W-I	RP-900-004	1
121	Variable, carbon, 10k ohm	RP-123-310	W-I	RP-123-310	1
122,123	Variable, carbon, 20k ohm	RP-124-320	A-B	WA2G032	2
124	Fixed, comp., 4.7kohm ±10% ¼W	RC-104-247	A-B	CB4721	1
125	Fixed, metal film 8.06k ohm ±1% ¼W	RF-21-3100	COR	C-4	1
126	Fixed, metal film, 10.0k ohm ±1% ¼W	RF-21-2806	COR	C-4	1
127	Fixed, metal film, 215 ohm ±1% ¼W	RF-21-1215	COR	C-4	1
128	Fixed, metal film, 191 ohm ±1% ¼W	RF-21-1191	COR	C-4	1

PARTS LIST MODEL 2001A HEAD REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"R "	RESISTORS				
129	Fixed, metal film 174 ohm ±1% ¼W	RF-21-1174	COR	C-4	1
130	Fixed, metal film 154 ohm ±1% ¼W	RF-21-1154	COR	C-4	1
131	Fixed, metal film 137 ohm ±1% ¼W	RF-21-1137	COR	C-4	1
132	Fixed, metal film 121 ohm ±1% ¼W	RF-21-1121	COR	C-4	1
133	Fixed, metal film 110 ohm ±1% ¼W	RF-21-1110	COR	C-4	1
134	Fixed, metal film 95.3 ohm ±1% ¼W	RF-21-0953	COR	C-4	1
135	Fixed, metal film 86.6 ohm ±1% ¼W	RF-21-0866	COR	C-4	1
136	Fixed, metal film 78.7 ohm ±1% ¼W	RF-21-0787	COR	C-4	1
137	Fixed, metal film 68.1 ohm ±1% ¼W	RF-21-0681	COR	C-4	1
138	Variable, carbon, 1k ohm	RP-133-210	A-B	WA2G056	1
139	Fixed, comp., 220 ohm ±10% ¼W	RC-104-122	A-B	CB2211	1
140	Fixed, comp., 10M ohm ±10% ¼W	RC-104-610	A-B	CB1061	1
141	Fixed, comp., 2.2k ohm ±10% ¼W	RC-104-222	A-B	CB2221	1
142	Variable, carbon, 10k ohm, part of S108	----------	---	----------	--
143	Fixed, comp., 33k ohm ±10% ¼W	RC-104-333	A-B	CB3331	1
144	Fixed, comp., 2.7k ohm ±10% ¼W	RC-104-227	A-B	CB2721	1
145	Fixed, comp., 1M ohm ±10% ¼W	RC-104-510	A-B	CB1051	1
146	Fixed, comp., 47k ohm ±10% ¼W	RC-104-347	A-B	CB4731	1
147	Fixed, comp., 15k ohm ± 10% ¼W	RC-104-315	A-B	CB1531	1
"S "	SWITCHES				
101	SPDT, Push/Push illuminated	SZ-000-003	M-O	54-6169126	1
102	Rotary, 6-pole, 6-position, assembly	SR-000-019	W-I	SR-000-019	1
103	SPST, Push on, (part of S102 assembly)	----------	----	----------	--
104	Momentary contact N.O. submin.	SM-000-004	G-H	39-1	1
105	DPST, Rotary, (part of R115)	----------	---	----------	--
106	2-pole, 3-position slide, submin.	SS-000-004	C-W	G128	1
107	Rotary, 1-pole, 12-position assembly	SR-000-021	W-I	SR-000-021	1
108	Rotary, 6-pole, 3-position	SR-000-020	OAK	399646-512	1
109	Push button switch assembly	SZ-000-011	C-L	PB10 7Sta	1
110	Rotary, 6-pole, 4-position assembly	SR-000-018	W-I	SR-000-018	1
111	DPDT, Slide, Subminiature	SS-000-001	C-W	G126	1
112	SPST, Push-off (part of S109 assembly)	----------	----	----------	1
SEE Fig. 3-2	MISCELLANEOUS MECHANICAL				
1,4	Knob, ½" dia. with pointer	KK-000-020	BUK	PS50PL-1	2
2	Knob, must be calibrated	----------	---	---------	1
2	Knob, 7/8" dia. and cap	KK-300-761	W-I	KK-300-761	1
3	Knob, engraved with 0-7(0) dB	KK-319-102	W-I	KK-319-102	1
3	Knob, with 0-11 dB, engraved skirt	KK-309-101	W-I	KK-309-101	1
5	Push button, black, plain	SZ-000-007	C-L	J52304B	-
8,10	Knob, 7/8" dia.	KW-130-309	WSD	130-309	2
8,10	Knob,	KK-300-762	W-I	KK-300-762	2
9	Knob, 7/8" dia.	KW-130-314	WSD	130-314	1

SWEEP RATE SCHEMATIC
MODULE M1H REV. A

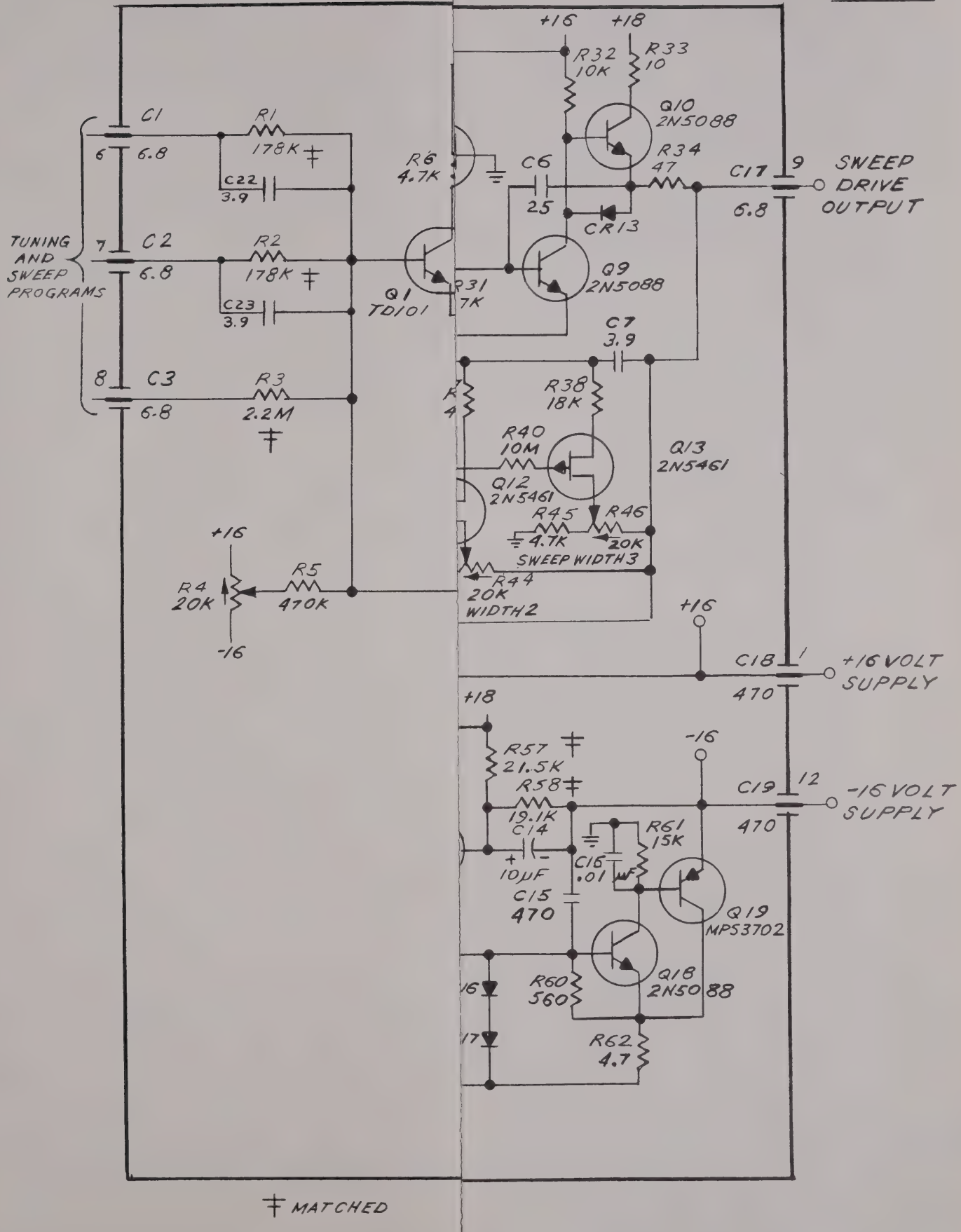
INTEGRATOR INPUT
C1 6.8
Q1/Q2 MATCHED SET
R2 4.7K
R3 4.7K
R4 47K
R5 4.7K
R6 180K
R7 20K
INT BAL
+18
-18
Q3 MPS 3702
R1 220
R55 6.8K
CR1 PIV100
C2 470
R57 47
Q4 MPS3702
R8 22K
R9 220
C21 .014F
C3 .15μF*
2N5458 Q5
C5 .001μF
R10 5.6M
C4 10
R21 18K
R54 27K
R20 20K
CLAMP
R22 62K
CLAMP LEVEL SHIFT
C8 6.8
R19 100K
CR2 PIV100
R24 100K
Q8 MPS3702
R23 560K
R25 1M
Q9 MPS3702
CR9 PIV100
R28 100K
Q11 MPS3702
R29 100K
R26 22K
2N3854A Q10
R27 22K
R30 10K
C10 .02μF
R33 47K
C11 470
TRIGGER INPUT
C9 6.8
R31 10K
Q12 2N3854A
R32 1K
Q13 2N3854A
CR3 PIV100
R34 10M
Q14 2N5458
TRIGGER ROUTING
C12 6.8
R11 4.7K
R13 47K
R14 4.7K
Q6 TD101
R15 68K
R51 10K
R16 10K
R12 47
Q7 MPS3702
C6 470
CR8 PIV100
R17 10K
Q19 MPS3702
R52 100
R18 47K
R53 47K
SWEEP DRIVE OUTPUT ∧32VP-P
C20 6.8
SCOPE HORIZ. OUTPUT ∧16VP-P
C7 6.8
INTEGRATOR OUTPUT
C14 6.8
R44 12K
R45 20K
SIZE
R46 39K
HYSTERESIS SWITCH OUTPUT
C15 6.8
R35 100
R36 22K
R37 4.7K
Q16 MPS3702
C13 120
Q15 TD101
R40 220K
R39 47K
R41 20K
CENT
R38 47K
CR4 PIV100
R42 6.8K
R43 100
R48 10K
CR5 PIV100
CR6 PIV100
Q17 MPS3702
R47 220K
R49 470
Q18 2N3854A
CR7 PIV100
R50 15K
R56 27K
C16 6.8
BLANKING OUTPUT ⎍ -1 TO +14V
TRIGGER OUTPUT
C17 6.8
C18 470
C19 470
-18 15/22 MA
+18 10/20MA

✡ = CONNECTED TO SWEEP TIME SWITCH

PARTS LIST — MODULE M1H REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"Q "	TRANSISTORS				
1,2	N-channel JFET'S, matched pair	QB000-014	W-I	QB000-014	1
3,4,7,8,9 11,16,17,19	PNP, Silicon	QB000-009	MOT	MPS3702	9
5,14	N-channel, Silicon, JFET	QA054-580	MOT	2N5458	2
6,15	Dual, NPN, Silicon	QB000-010	SPR	TD101	2
10,12,13,18	NPN, Silicon	QA038-541	G-E	2N3854A	4

EEP DRIVE SCHEMATIC
MODULE M2J
REV B



PARTS LIST — MODULE M1H REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,7,8,9 12,14,15 16,17,20	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	10
2,6,11	Ceramic disc, 470pF, ±20% 1KV	CD102-147	SPR	5GAT47	3
3	Mylar paper, 15uF ±10% 100V	CP103-415	C-D	WMF1P15	1
4	Ceramic disc, 10pF ±5% 1KV	CD101-010	SPR	10TCCV10	1
5	Ceramic disc, .001uF ±20% 1KV	CD102-210	SPR	5GA010	1
10	Ceramic disc, .02uF ±20% 100V	CD103-320	SPR	TGS20	1
13	Ceramic disc, 120pF ±20% 1KV	CD102-112	SPR	5GAT12	1
18,19	Ceramic feedthru, 470pF ±20% 500V	CF101-147	A-B	FA5C	2
21	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TGS10	1
"CR "	DIODES				
1,2,3,4,5 6,7,8,9	Silicon, junction, 100PIV, 750mA	DR000-001	ITT	1N4002	9
"R "	RESISTORS				
1,9	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	2
2,3,5,11 14,37	Fixed, comp., 4.7k ±10% ¼W	RC104-247	A-B	CB4721	6
4,13,18,33 38,39,53	Fixed, comp., 47k ±10% ¼W	RC104-347	A-B	CB4731	7
6	Fixed, comp., 180k ±10% ¼W	RC104-418	A-B	CB1841	1
7,20,41,45	Variable, carbon, 20k ±20%	RP124-320	A-B	WA2G032	4
8,26,27,36	Fixed, comp., 22k ±10% ¼W	RC104-322	A-B	CB2231	4
10	Fixed, comp., 5.6M ±10% ¼W	RC104-556	A-B	CB5651	1
12,57	Fixed, comp., 47ohm ±10% ¼W	RC104-047	A-B	CB4701	2
15	Fixed, comp., 68k ±10% ¼W	RC104-368	A-B	CB6831	1
16,51	Fixed, comp., 10k ±5% ¼W	RC103-310	A-B	CB1035	2
17,30,31,48	Fixed, comp., 10k ±10% ¼W	RC104-310	A-B	CB1031	4
19,24,28,29	Fixed, comp., 100k ±10% ¼W	RC104-410	A-B	CB1041	4
21	Fixed, comp., 18k ±10% ¼W	RC104-318	A-B	CB1831	1
22	Fixed, comp., 62k ±5% ¼W	RC103-362	A-B	CB6235	1
23	Fixed, comp., 560k ±10% ¼W	RC104-456	A-B	CB5641	1
25	Fixed, comp., 1M ±10% ¼W	RC104-510	A-B	CB1051	1
32	Fixed, comp., 1k ±10% ¼W	RC104-210	A-B	CB1021	1
34	Fixed, comp., 10M ±10% ¼W	RC104-610	A-B	CB1061	1
35,43,52	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1011	3
40,47	Fixed, comp., 220k ±10% ¼W	RC104-422	A-B	CB2241	2
42,55	Fixed, comp., 6.8k ±10% ¼W	RC104-268	A-B	CB6821	2
44	Fixed, comp., 12k ±10% ¼W	RC104-312	A-B	CB1231	1
46	Fixed, comp., 39k ±10% ¼W	RC104-339	A-B	CB3931	1
49	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	1
50	Fixed, comp., 15k ±10% ¼W	RC104-315	A-B	CB1531	1
54,56	Fixed, comp., 27k ±10% ¼W	RC104-327	A-B	CB227	2

PARTS LIST — MODULE M1H REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"Q "	TRANSISTORS				
1,2	N-channel JFET'S, matched pair	QB000-014	W-I	QB000-014	1
3,4,7,8,9 11,16,17,19	PNP, Silicon	QB000-009	MOT	MPS3702	9
5,14	N-channel, Silicon, JFET	QA054-580	MOT	2N5458	2
6,15	Dual, NPN, Silicon	QB000-010	SPR	TD101	2
10,12,13,18	NPN, Silicon	QA038-541	G-E	2N3854A	4

SWEEP DRIVE SCHEMATIC
MODULE M2J
REV B

TUNING AND SWEEP PROGRAMS

C1 6.8 — R1 178K ‡ — C22 3.9
C2 6.8 — R2 178K ‡ — C23 3.9
C3 6.8 — R3 2.2M ‡

Q1 TD101 — R6 4.7K — R7 8.2K * — R8 47K — R9 100 — +18 — -16
Q2 2N4250 — C4 15 — CR1
Q3 2N4250 — R10 10K — R11 100 — -18 — C5 2.4

+16 — R4 20K — -16 — R5 470K — R12 82K — R13 20K

R14 10K — R15 470 — R20 2.2K — R21 2.2K — R22 2.2K — R23 2.2K

CR2 * CR3 * CR4 * CR5 * CR6 * CR7 * CR8 * CR9 * CR10 * CR11 * CR12 *

R16 20K — R17 4.7K — R18 4.7K — R19 4.7K — Q4 2N4250

+16 — Q14 TD101 — R47 470 — CR14 — CR15 — R48 8.2K — -18

+18 — R50 4.7 — Q15 2N4250 — R49 560 — C12 470 — R51 15K — C13 .01µF — Q16 2N5088 — C11 10µF — R52 10K — R53 10K — R54 1.2M — R55 20K — -16 — +16

R24 100K

Q5 2N5461 — Q6 2N5461 — Q7 2N5461 — R25 10M — R26 10M — R27 10M — B-1 — B-2 — B-3

Q8 TD401 — R30 47K — R29 4.7K — R28 10 — -18 — R31 27K

+16 — +18 — R32 10K — R33 10 — Q10 2N5088 — R34 47 — C6 25 — CR13 — Q9 2N5088 — C17 6.8 — 9 — SWEEP DRIVE OUTPUT

C7 3.9 — R36 18K — R37 18K — R38 18K — R40 10M — Q13 2N5461 — R39 10M — Q12 2N5461 — R45 4.7K — R46 20K — SWEEP WIDTH3 — R35 10M — Q11 2N5461 — R43 4.7K — R44 20K — SWEEP WIDTH2 — R41 4.7K — R42 20K — SWEEP WIDTH1

+16 — C18 470 — 1 — +16 VOLT SUPPLY

+18 — R56 8.2K — Q17 TD401 — R57 21.5K — R58 19.1K — C14 10µF — C16 .01µF — C15 470 — R61 15K — Q19 MPS3702 — Q18 2N5088 — R60 560 — CR16 — R59 470 — CR17 — R62 4.7 — -18

-16 — C19 470 — 12 — -16 VOLT SUPPLY

B-3 — C8 470 — 10 — B-3
B-1 — C9 470 — 4 — B-1
B-2 — C10 470 — 5 — B-2

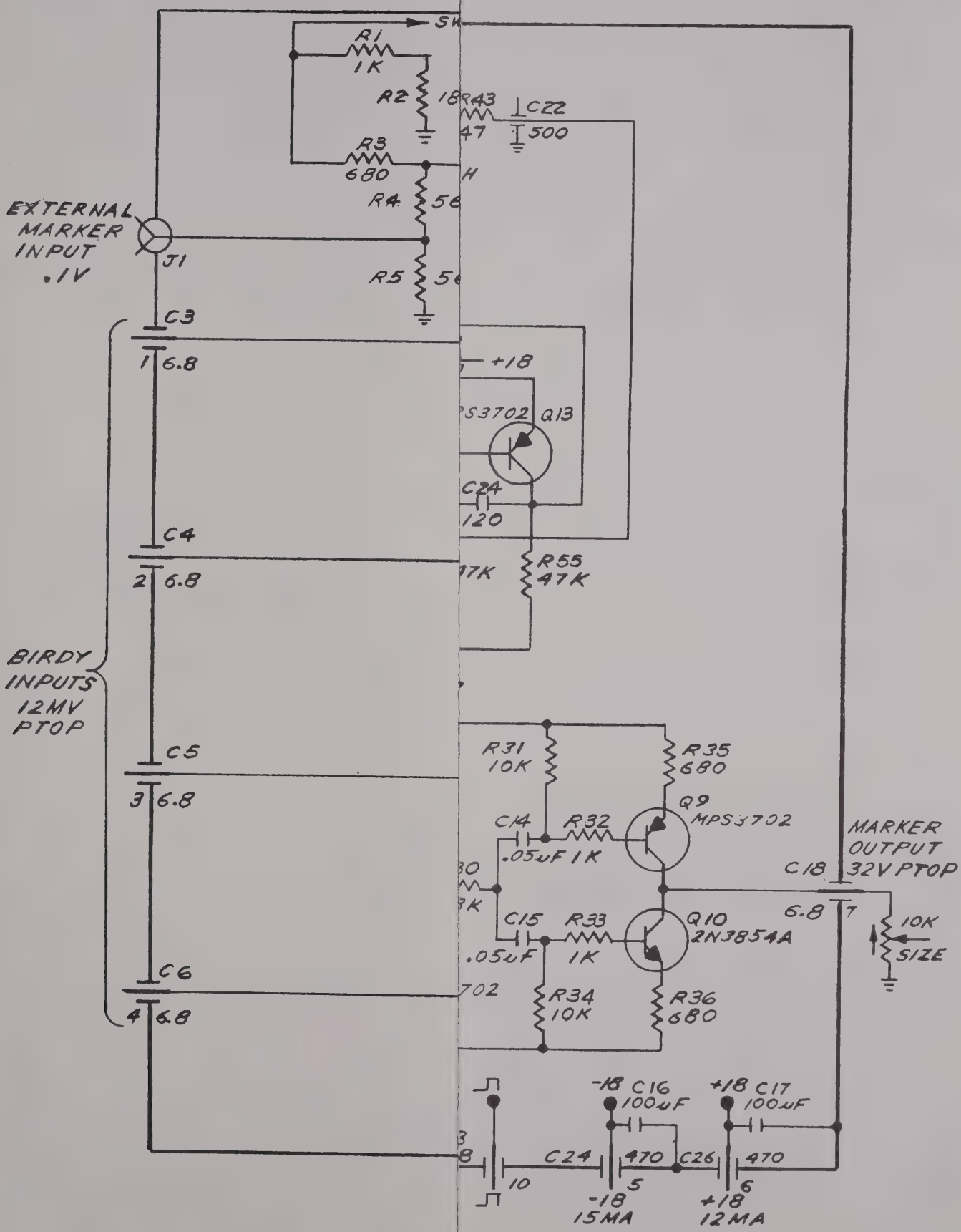
-18 — C20 470 — 3 — -18V 27MA
+18 — C21 470 — 2 — +18V 27MA
+7 -5

‡ MATCHED

RKER ADDER SCHEMATIC
ODULE M5G AND M5H

OUTPUT

REV. C



PARTS LIST

MODULE M2J REV B

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
" C "	CAPACITORS				
1,2,3,17	Ceramic feedthru, 6.pF ± 10% 500V	CF-102-R68	A-B	FA5C	4
4	Ceramic disc., 15 pF ± 5% 1kV	CD-101-015	SPR	10TCC-Q15	1
5	Composition 2.4pF ± 10% 500V	CG-101-224	Q-C	QC2.4	1
6	Ceramic disc., .25pF ± 5% 1kV	CD-101-025	SPR	10TCC-Q25	1
7,22,23	Composition 3.9pF ± 10% 500V	CG-101-239	Q-C	QC3.9	3
8,9,10,18	Ceramic feedthru, 470pF ± 20% 500V	CF-101-147	A-B	FA5C	7
19,20,21					
11,14	Electrolytic, 10uF, 25V	CE-105-010	SPR	TE1204	2
12,15	Ceramic dis., 470pF ± 20% 1kV	CD-102-147	SPR	5GAT47	2
13,16	Ceramic disc., .01uF ± 20% 100V	CD-103-310	SPR	TGS10	2
" CR "	DIODES				
1 to 17	Silicon, Junction 100piV, 750mA	DR-000-001	ITT	1N4002	17
" R "	RESISTORS				
1,2	Deposited carb. 178 k, matched set .1%	RX-000-005	W-I	RX-000-005	1
3	Fixed, comp., 2.2M ohm ± 5% ¼W	RC-103-522	A-B	CB2255	1
4,13,16,42 44,46.55	Variable, cermet, 20k ohm± 10% 3/4W	RP-130-320	BEK	89PR20K	7
5	Fixed, comp., 470k ohm ± 10% ¼W	RC-104-447	A-B	CB4741	1
6,17,18,19 29,41,43,45	Fixed, comp., 4.7k ohm ± 10% ¼W	RC-104-247	A-B	CB4721	8
7,48,56	Fixed, comp., 8.2k ohm ± 10% ¼W	RC-104-282	A-B	CB8221	3
8,30	Fixed, comp., 47k ohm ± 10% ¼W	RC-104-347	A-B	CB4731	2
9,11	Fixed, comp., 100 ohm ± 10% ¼W	RC-104-110	A-B	CB1011	2
10,14,32	Fixed, comp., 10k ohm ± 10% ¼W	RC-104-310	A-B	CB1031	3
12	Fixed, comp., 82k ohm ± 10% ¼W	RC-104-382	A-B	CB8231	1
15,47,59	Fixed, comp., 470 ohm ± 10% ¼W	RC-104-147	A-B	CB4711	3
20,21,22,23	Fixed, comp., 2.2k ohm ± 10% ¼W	RC-104-222	A-B	CB2221	4
24	Fixed, comp., 100k ohm ± 10% ¼W	RC-104-410	A-B	CB1041	1
25,26,27,35 39,40	Fixed, comp., 10M ohm ± 10% ¼W	RC-104-610	A-B	CB1061	6
28,33	Fixed, comp., 10 ohm ± 10% ¼W	RC-104-010	A-B	CB1001	2
31	Fixed, comp., 27k ohm ± 10% ¼W	RC-104-327	A-B	CB2731	1
34	Fixed, comp., 47 ohm ± 10% ¼W	RC-104-047	A-B	CB4701	1
36,37,38	Fixed, comp., 18k ohm ± 10% ¼W	RC-104-318	A-B	CB1831	3
49,60	Fixed, comp., 560 ohm ± 10% ¼W	RC-104-156	A-B	CB5611	2
50,62	Fixed comp., 4.7 ohm ± 10% ¼W	RC-104-R47	A-B	CB47G1	2
51,61	Fixed, comp., 15k ohm ± 10% ¼W	RC-104-315	A-B	CB1531	2
52,53	Deposited carb. 10k ohm, matched set .1%	RX-000-003	W-I	RX-000-003	1
54	Fixed, comp., 1.2M ohm ± 10% ¼W	RC-104-512	A-B	CB1251	1
57 58	Deposited carb. 21.5k / Deposited carb. 19.k } matched set 9:8 within .1%	RX-000-004	W-I	RX-000-004	1
" Q "	TRANSISTORS				
1,14	NPN, Silicon, Dual	QB-000-010	SPR	TD101	2
2,3,4,15	PNP, Silicon	QA-042-500	FCD	2N4250	4
5,6,7,11,12 13	P Channel JFET	QA-054-610	MOT	2N5461	6
8,17	PNP, Silicon, Dual	QB-000-011	SPR	TD401	2
9,10,16,18	NPN, Silicon	QA-050-880	MOT	2N5088	4
19	PNP, Silicon	QB-000-009	MOT	MPS3702	1

MARKER ADDER SCHEMATIC
MODULE M5G AND M5H

REV. C

SWEEP SAMPLE INPUTS

SWEEP SAMPLE OUTPUT

BAND 1 "A" J2

BAND 2+3 "D" J3

J4

SWEEP SAMPLE

EXTERNAL MARKER INPUT .1V J1

BIRDY INPUTS 12MV PTOP

MARKER OUTPUT 32V PTOP

TO SHAPER

NOTE: M5H AS SHOWN - M5G OMIT PARTS IN SHADED AREA AND CONNECT C-19 DIRECTLY TO J-2

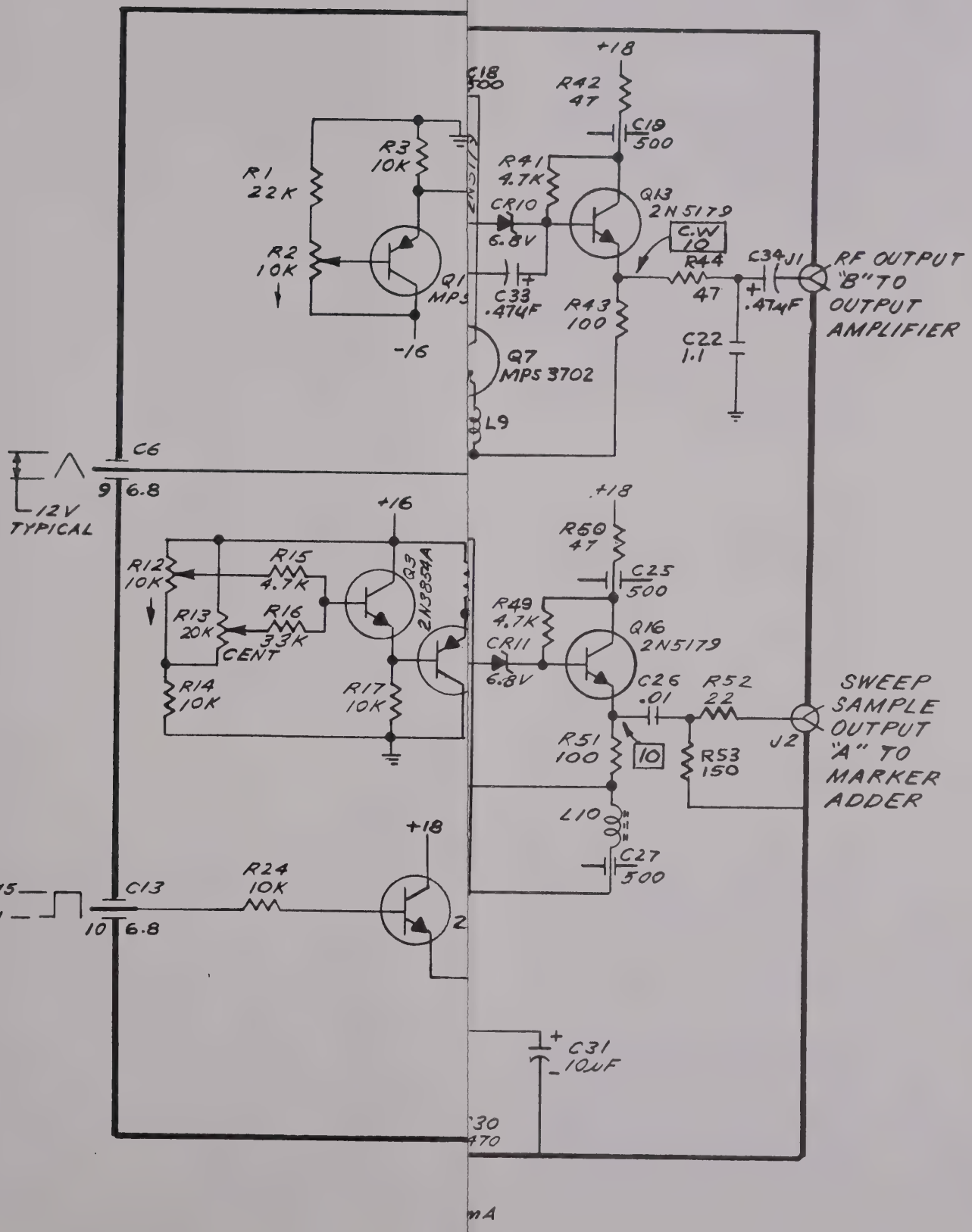
5

PARTS LIST — MODULE M5H REV. C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS (Continued)				
46	Variable, carbon 20k ±20% ¼W	RP124-320	A-B	WA2G032	1
47	Fixed, comp., 470k ±10% ¼W	RC104-447	A-B	CB4741	1
53	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	1
"Q "	TRANSISTORS				
1,2,3,4	NPN, Silicon	QA050-880	MOT	2N5088	5
5					
6,12	Dual NPN, Silicon	QB000-010	SPR	TD101	2
7,8,9,13	PNP, Silicon	QB000-009	MOT	MPS3702	4
10	NPN, Silicon	QA038-541	GE	2N3854A	1
11	N-channel JFET	QA054-580	MOT	2N5458	1

LATOR-MIXER SCHEMATIC
MODULE M9G & M9H

REV C



PARTS LIST — MODULE M5H REV. C

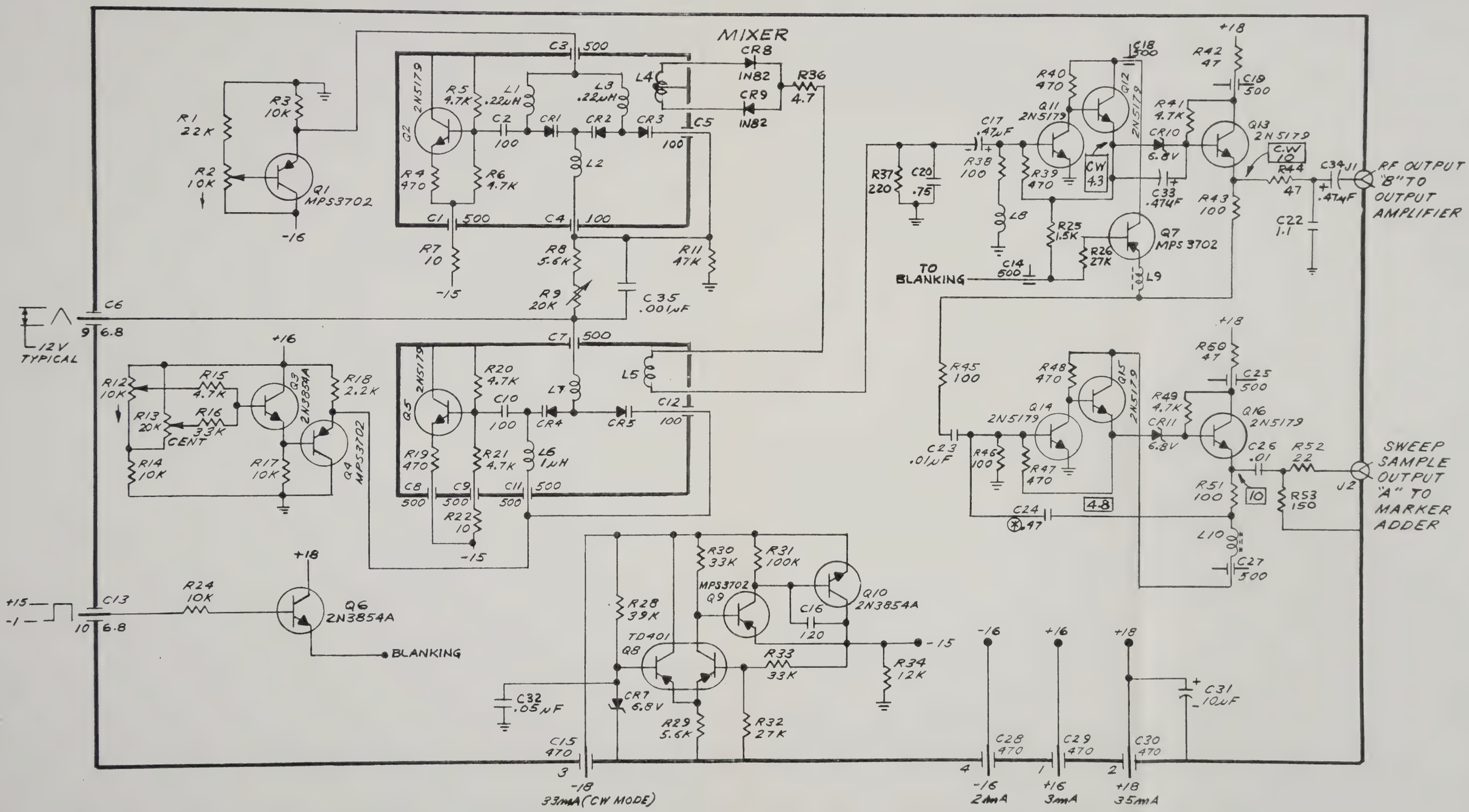
REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,21,22	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	3
2	Ceramic disc., .025uF ±20% 100V	CD103-325	SPR	TG-S25	1
3,4,5,6,9	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	9
10,11,13,18					
7	Electrolytic 10uF 25V	CE105-010	SPR	TE-1204	1
8,14,15,19	Ceramic disc., .05uF ±20% 100V	CD103-350	SPR	TG-S50	4
12,24,26	Ceramic feedthru, 470pF ±20% 500V	CF101-147	A-B	FA5C	3
16,17	Electrolytic 100uF 25V	CE105-110	SPR	TE-1211	2
20	Ceramic disc., .005uF ±20% 100V	CD103-250	SPR	TG-D50	1
23	Ceramic disc., 470uF ±20% 1kV	CD102-147	SPR	5GAT47	1
24	Ceramic disc., 120uF ±20% 1kV	CD102-112	SPR	5GAT12	1
"J "	CONNECTORS				
1,2,3,4	Jack, receptacle, 50ohm, submin.	JF000-005	APL	27-9	4
"CR "	DIODES				
2,7	Silicon, point contact	DG100-821	SYL	1N82AS	2
3	Silicon, junction, 100piV 750mA	DR000-001	ITT	1N4002	1
4,5,6	Silicon, P.I.N.	DP000-040	W-I	DP000-040	3
"L "	INDUCTORS				
1	Fixed, .22uH	LA005-R02	W-E	506	1
2	Fixed	LA006-010	W-I	LA006-010	1
"R "	RESISTORS				
1,32,33,48	Fixed, comp., 1k ±10% ¼W	RC104-210	A-B	CB1021	4
2	Fixed, comp., 180ohm ±10% ¼W	RC104-118	A-B	CB1811	1
3,35,36	Fixed, comp., 680ohm ±10% ¼W	RC104-168	A-B	CB6811	3
4,5	Fixed, comp., 56ohm ±10% ¼W	RC104-056	A-B	CB5601	2
6,8,10	Fixed, comp., 22k ±10% ¼W	RC104-322	A-B	CB2231	6
13,16,19					
7,11,14	Fixed, comp., 270ohm ±10% ¼W	RC104-127	A-B	CB2711	5
17,20					
9,12,15	Fixed, comp., 5.6k ±10% ¼W	RC104-256	A-B	CB5621	4
18					
21,29	Fixed, comp., 3.3k ±10% ¼W	RC104-233	A-B	CB3321	2
22,23,28	Fixed, comp., 10k ±10% ¼W	RC104-310	A-B	CB1031	7
31,34,51					
52					
24,38,50	Fixed, comp., 4.7k ±10% ¼W	RC104-247	A-B	CB4721	3
25,54,55,56	Fixed, comp., 47k ±10% ¼W	RC104-347	A-B	CB4731	4
26,40	Fixed, comp., 2.2k ±10% ¼W	RC104-222	A-B	CB2221	2
27	Fixed, comp., 220k ±10% ¼W	RC104-422	A-B	CB2241	1
30	Fixed, comp., 1.8k ±10% ¼W	RC104-218	A-B	CB1821	1
37,39,49	Fixed, comp., 2.7k ±10% ¼W	RC104-227	A-B	CB2721	3
41	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1011	1
42	Fixed, comp., 47ohm ±5% ½W	RC105-047	A-B	EB4705	1
43	Fixed, comp., 47ohm ±5% ¼W	RC103-047	A-B	CB4705	1
44	Fixed, comp., 1M ±10% ¼W	RC104-510	A-B	CB1051	1
45	Fixed, comp., 2.2M ±10% ¼W	RC104-522	A-B	CB2251	1

PARTS LIST — MODULE M5H REV. C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS (Continued)				
46	Variable, carbon 20k ±20% ¼W	RP124-320	A-B	WA2G032	1
47	Fixed, comp., 470k ±10% ¼W	RC104-447	A-B	CB4741	1
53	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	1
"Q "	TRANSISTORS				
1,2,3,4	NPN, Silicon	QA050-880	MOT	2N5088	5
5					
6,12	Dual NPN, Silicon	QB000-010	SPR	TD101	2
7,8,9,13	PNP, Silicon	QB000-009	MOT	MPS3702	4
10	NPN, Silicon	QA038-541	GE	2N3854A	1
11	N-channel JFET	QA054-580	MOT	2N5458	1

OSCILLATOR-MIXER SCHEMATIC
MODULE M9G & M9H

REV C



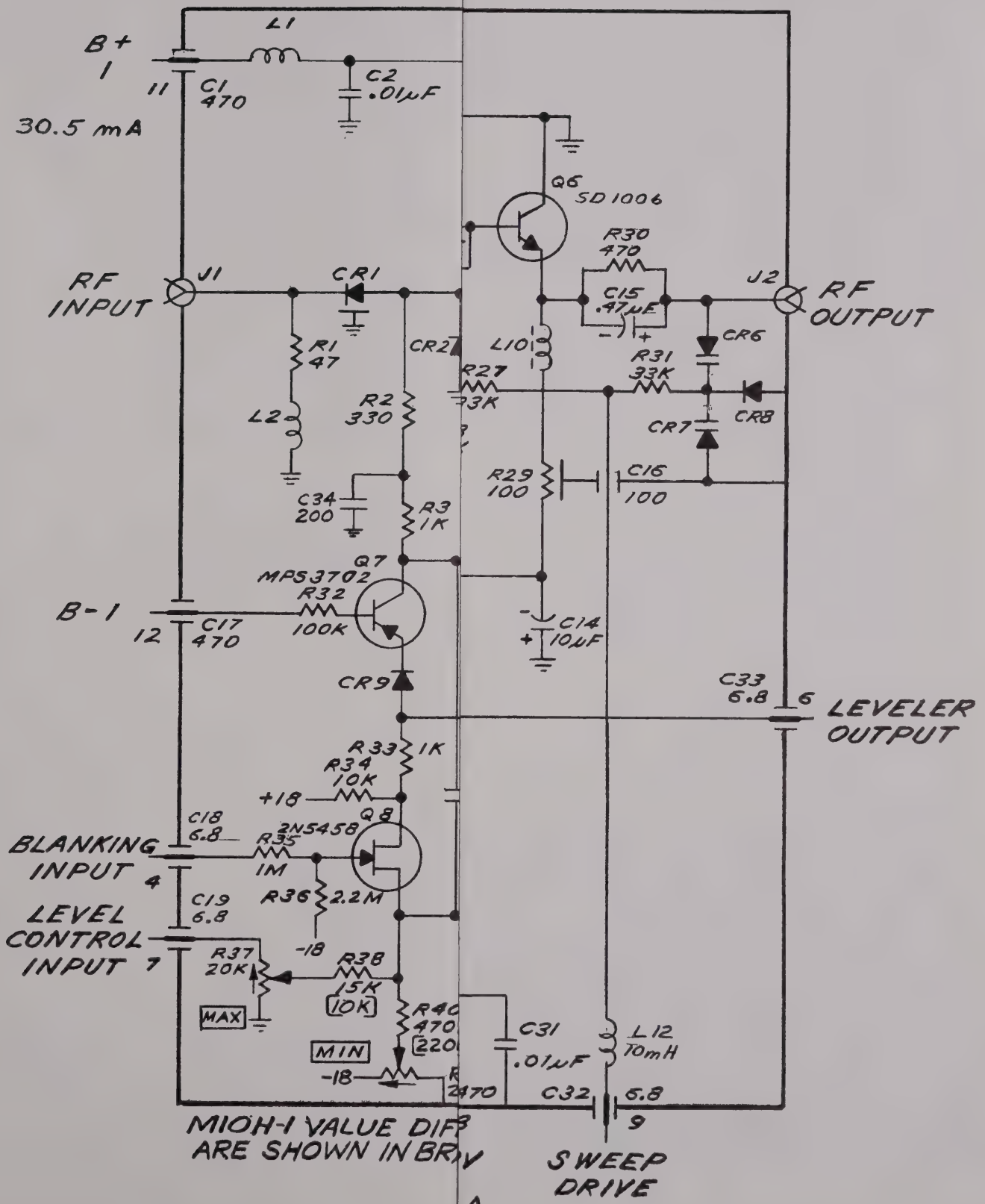
PARTS LIST

MODULE M9G M9H REV C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
18	Fixed, comp., 2.2kohm ±10% ¼W	RC-104-222	A-B	CB2221	1
25	Fixed, comp., 1.5kohm ±10% ¼W	RC-104-215	A-B	CB1521	1
26	Fixed, comp., 27kohm ±10% ¼W	RC-104-327	A-B	CB2731	1
28	Fixed, comp., 39kohm ±10% ¼W	RC-104-339	A-B	CB3931	1
31	Fixed, comp., 100kohm ±10% ¼W	RC-104-410	A-B	CB1041	1
32	Fixed, comp., 27kohm ± 5 % ¼W	RC-103-327	A-B	CB2735	1
33	Fixed, comp., 33kohm ± 5 % ¼W	RC-103-333	A-B	CB3335	1
34	Fixed, comp., 12kohm ±10% ¼W	RC-104-312	A-B	CB1231	1
36	Fixed, comp., 4.7ohm ±10% ¼W	RC-104-R47	A-B	CB47G1	1
37	Fixed, comp., 220ohm ±10% ¼W	RC-104-122	A-B	CB2211	1
38,43,45,46, 51	Fixed, comp., 100ohm ±10% ¼W	RC-104-110	A-B	CB1011	5
42,44,50	Fixed, comp., 47ohm ±10% ¼W	RC-104-047	A-B	CB4701	3
52	Fixed, comp., 22ohm ±10% ¼W	RC-104-022	A-B	CB2201	1
53	Fixed, comp., 150ohm ±10% ¼W	RC-104-115	A-B	CB1511	1
"Q "	TRANSISTORS				
1,4,5,9	PNP, Silicon,	QB-000-009	MOT	MPS3702	4
2,6,11,12,13, 14,15,16	NPN, Silicon,	QA-051-790	RCA	2N5179	8
3,7,10	NPN, Silicon,	QA-038-541	G-E	2N3854A	3
8	PNP, Silicon, dual	QB-000-011	SPR	TD401	1

T AMPLIFIER SCHEMATIC
MODULE MIOH & MIOH-1

REV E



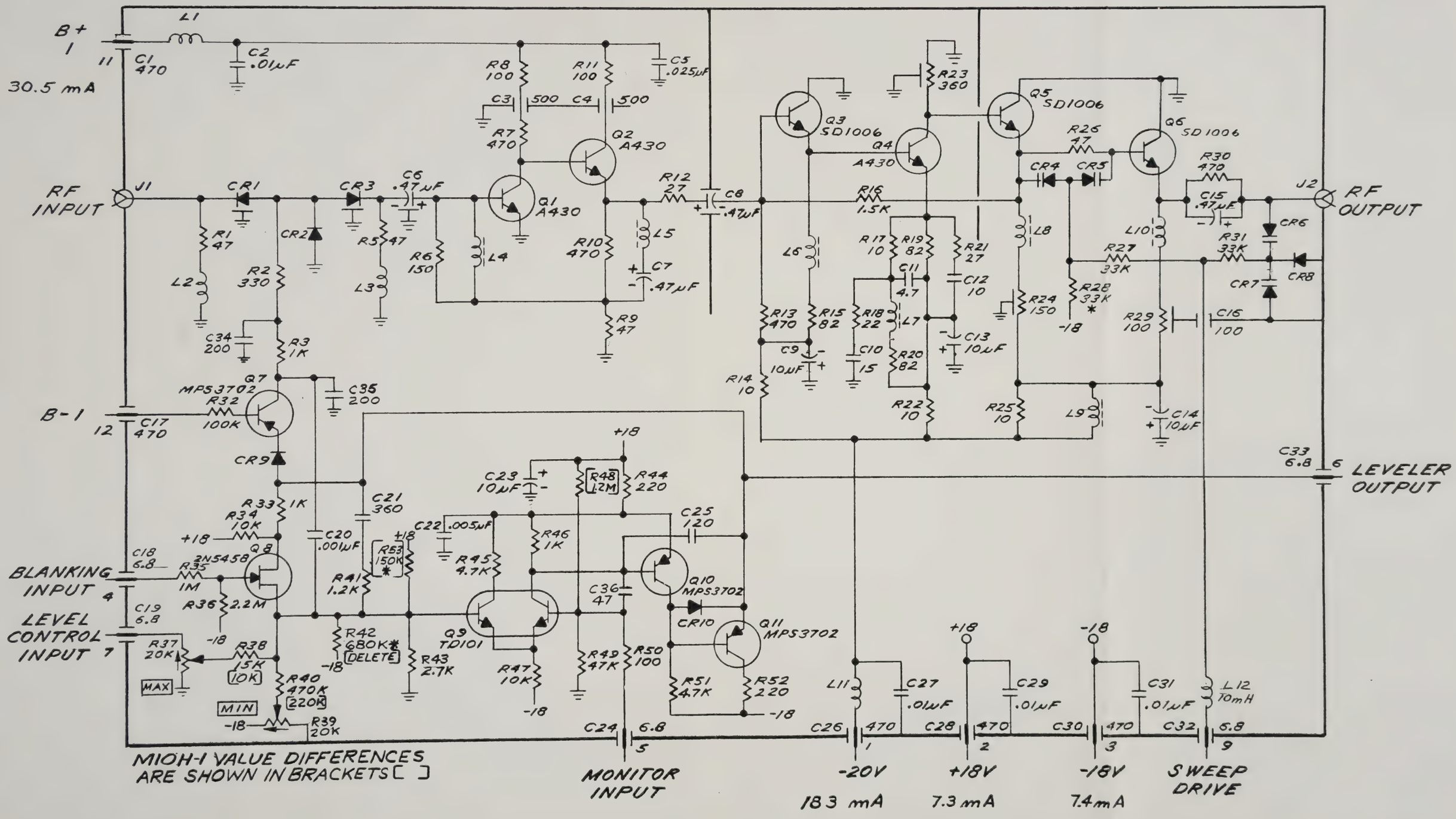
PARTS LIST — MODULE M9G M9H REV C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,3,7,8,9, 11,14,18,19, 25,27	Ceramic feedthru, 500pF ±20% 250V	CF-104-150	AER	EF4	11
2,10	Ceramic disc, 100pF ±10% 1kV	CD-108-110	RMC	C,N750	2
5,12,4	Ceramic feedthru, 100pF ±20% 250V	CF-104-110	AER	EF4	3
6,13	Ceramic feedthru, 6.8pF ±10% 500V	CF-102-R68	A-B	FA5C	2
15,28,29,30	Ceramic feedthru, 470pF ±20% 500V	CF-101-147	A-B	FA5C	4
16	Ceramic disc, 120pF ±20% 1kV	CD-102-112	SPR	5GAT12	1
17,33,34	Electrolytic, .47uF 50V	CE-113-447	TRW	935	3
20	Composition, .75pF ±10% 500V	CG-101-175	Q-C	QC.75	1
21	Factory adjusted, nominal value shown	Not Assign.	---	--------	--
22	Composition, 1.1uF ±10%, factory adj.	CG-101-211	Q-C	QC1.1	1
23,26	Ceramic disc, .01uF ±20% 100V	CD-103-310	SPR	TGS10	2
24	Factory adjusted, nominal value shown	Not Assign.	---	--------	--
31	Electrolytic, 10uF 25V	CE-105-010	SPR	TE1204	1
32	Ceramic disc, .05uF ±20% 100V	CD-103-350	SPR	TGS50	1
35	Ceramic disc, .001uF ± 20% 1kV	CD-102-210	SPR	5GAD10	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm, submin.	JF-000-005	APL	27-9	2
"CR "	DIODES				
1,2,3,4,5	Voltage variable capacitance	DC-000-005	W-I	DC-000-005	5
6	Not assigned	----------	---	---------	--
7,10,11	Zener, 6.8V	DB-000-001	C-L	HW-6.8	3
8,9	Silicon, point contact	DG-100-821	SYL	IN82AS	2
"L "	INDUCTORS				
1,3	Fixed, .22uH	LA-005-R02	W-E	506	2
2,7	Fixed ------	Not Assign.	W-I	----------	--
4	Fixed ------	Not Assign.	W-I	----------	--
5	Fixed ------	Not Assign.	W-I	----------	--
6	Fixed 1uH	LA-005-R10	W-E	506	1
8	Fixed ------	Not Assign.	W-I	----------	--
9,10	Fixed ------	LA-006-004	W-I	LA-006-004	2
"R "	RESISTORS				
1	Fixed, comp., 22kohm ±10% ¼W	RC-104-322	A-B	CB2231	1
2,12	Variable,cermet, 10kohm ±20%	RP-129-310	CTS	360S103B	2
3,14,17,24	Fixed, comp., 10kohm ±10% ¼W	RC-104-310	A-B	CB1031	4
4,19,39,40, 47,48	Fixed, comp., 470ohm ±10% ¼W	RC-104-147	A-B	CB4711	6
5,6,15,20,21, 41,49	Fixed, comp., 4.7kohm ±10% ¼W	RC-104-247	A-B	CB4721	7
7,22,	Fixed, comp., 10ohm ±10% ¼W	RC-104-010	A-B	CB1001	2
8,29	Fixed, comp., 5.6kohm ±10% ¼W	RC-104-256	A-B	CB5621	2
9	Variable, cermet, 20kohm ±10%	RP-129-320	CTS	360S203B	1
10,23,27,35	Not Assigned	----------	---	----------	--
11	Fixed, comp., 47kohm ±10% ¼W	RC-104-347	A-B	CB4731	1
13	Variable, carbon, 20kohm ±20%	RP-124-320	A-B	WA2G032	1
16, 30	Fixed, comp., 33kohm ±10% ¼W	RC-104-333	A-B	CB3331	2

PARTS LIST — MODULE M9G M9H REV C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
18	Fixed, comp., 2.2kohm ±10% ¼W	RC-104-222	A-B	CB2221	1
25	Fixed, comp., 1.5kohm ±10% ¼W	RC-104-215	A-B	CB1521	1
26	Fixed, comp., 27kohm ±10% ¼W	RC-104-327	A-B	CB2731	1
28	Fixed, comp., 39kohm ±10% ¼W	RC-104-339	A-B	CB3931	1
31	Fixed, comp., 100kohm ±10% ¼W	RC-104-410	A-B	CB1041	1
32	Fixed, comp., 27kohm ± 5 % ¼W	RC-103-327	A-B	CB2735	1
33	Fixed, comp., 33kohm ± 5 % ¼W	RC-103-333	A-B	CB3335	1
34	Fixed, comp., 12kohm ±10% ¼W	RC-104-312	A-B	CB1231	1
36	Fixed, comp., 4.7ohm ±10% ¼W	RC-104-R47	A-B	CB47G1	1
37	Fixed, comp., 220ohm ±10% ¼W	RC-104-122	A-B	CB2211	1
38,43,45,46, 51	Fixed, comp., 100ohm ±10% ¼W	RC-104-110	A-B	CB1011	5
42,44,50	Fixed, comp., 47ohm ±10% ¼W	RC-104-047	A-B	CB4701	3
52	Fixed, comp., 22ohm ±10% ¼W	RC-104-022	A-B	CB2201	1
53	Fixed, comp., 150ohm ±10% ¼W	RC-104-115	A-B	CB1511	1
"Q "	TRANSISTORS				
1,4,5,9	PNP, Silicon,	QB-000-009	MOT	MPS3702	4
2,6,11,12,13, 14,15,16	NPN, Silicon,	QA-051-790	RCA	2N5179	8
3,7,10	NPN, Silicon,	QA-038-541	G-E	2N3854A	3
8	PNP, Silicon, dual	QB-000-011	SPR	TD401	1

OUTPUT AMPLIFIER SCHEMATIC
MODULE M10H & M10H-1
REV E



MIOH-1 VALUE DIFFERENCES ARE SHOWN IN BRACKETS [ ]

PARTS LIST

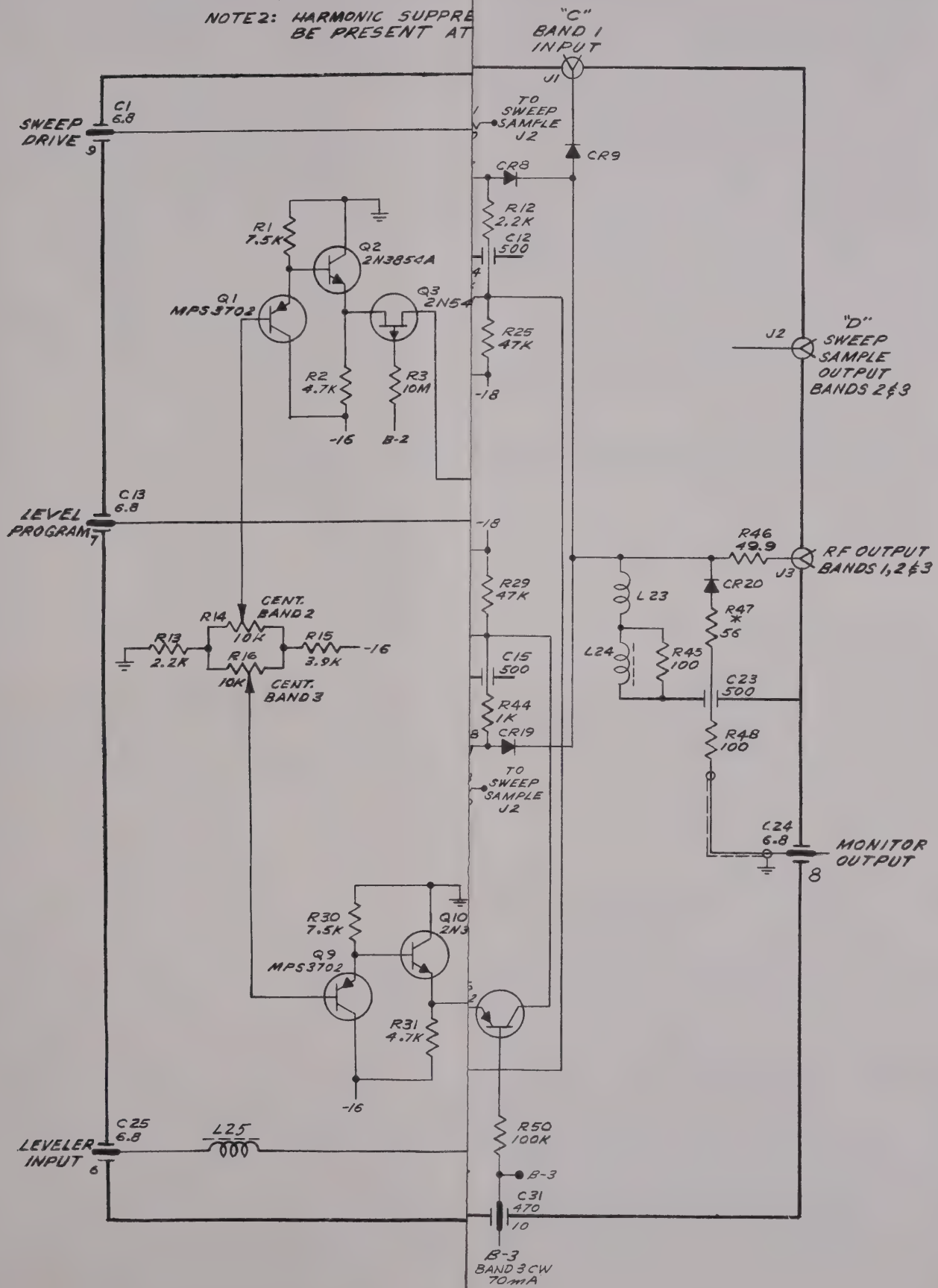
MODULE M10H & M10H-1 REV E

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R"	RESISTORS				
24	Fixed, comp., 150ohm ±5% 1W	RC107-115	A-B	GB1515	1
27,28,31	Fixed, comp., 33kohm ±10% ¼W	RC104-333	A-B	CB3331	3
29	Fixed, comp., 100ohm ±5% 1W	RC107-110	A-B	GB1015	1
32	Fixed, comp., 100kohm ±10% ¼W	RC104-410	A-B	CB1041	1
34,(38),47	Fixed, comp., 10kohm ±10% ¼W	RC104-310	A-B	CB1031	3
35	Fixed, comp., 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1
36	Fixed, comp., 3.3Mohm ±10% ¼W	RC104-522	A-B	CB2251	1
37,39	Variable, carbon 20kohm ±20% ¼W	RC104-320	A-B	WA2G032	2
38	Fixed, comp., 15kohm ±10% ¼W	RC104-315	A-B	CB1531	1
40	Fixed, comp., 470kohm ±10% ¼W	RC104-447	A-B	CB4741	1
(40)	Fixed, comp., 220kohm ±10% ¼W	RC104-422	A-B	CB2241	1
41	Fixed, comp., 1.2kohm ±10% ¼W	RC104-212	A-B	CB1221	1
42	Fixed, comp., 680kohm ±10% ¼W	RC104-468	A-B	CB6841	1
43	Fixed, comp., 2.7kohm ±10% ¼W	RC104-227	A-B	CB2721	1
44,52	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	2
45,51	Fixed, comp., 4.7kohm ±10% ¼W	RC104-247	A-B	CB4721	2
(48)	Fixed, comp., 1.2Mohm ±10% ¼W	RC104-512	A-B	CB1251	1
49	Fixed, comp., 47kohm ±10% ¼W	RC104-347	A-B	CB4731	1
53	Fixed, comp., 150kohm ±10% ¼W	RC104-415	A-B	CB1541	1
"Q"	TRANSISTORS				
1,2,4	NPN, Silicon	QB000-013	AER	A430	3
4,5,6	NPN, Silicon	QB000-018	SSS	SD1006	3
7,10,11	PNP. Silicon	QB000-009	MOT	MPS3702	3
	N-channel JFET, Silicon	QA054-580	MOT	2N5458	1
	NPN, Silicon, dual	QB000-010	SPR	TD101	1

TP OSCILLATOR SCHEMATIC
BAND 2 & 3
MODULE M19H
"A" VERSION (SEE NOTE 1) REV F

NOTE 1: "A" VERSION = CHAN
PARTS AFFECTED

NOTE 2: HARMONIC SUPPRE
BE PRESENT AT



PARTS LIST — MODULE M10H M10H-1 REV E

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,17,26,28, 30	Ceramic feedthru, 470pF ±20% 500V	CF101-147	A-B	FA5C	5
2,27,29,31	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	4
3,4	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	2
5	Ceramic disc, .025uF ±20% 100V	CD103-325	SPR	TG-S25	1
6,7,8,15	Electrolytic, .47uF 50V	CE113-447	TRW	935	4
9,13,14,23	Electrolytic, 10uF 25V	CE105-010	SPR	TE1204	4
10	Ceramic disc, 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
11	Ceramic disc, 4.7pF ±5% 1kV	CD101-R47	SPR	10TCC-V47	1
12	Ceramic disc, 10pF ±5% 1kV	CD101-010	SPR	10TCC-Q10	1
16	Ceramic feedthru, 100pF ±20% 250V	CF104-110	AER	EF4	1
18,19,24,32, 33	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	5
20	Ceramic disc, .001uF ±20% 1kV	CD102-210	APR	5GA-D10	1
21	Ceramic disc, 360pF ±20% 1kV	CD102-136	SPR	5GA-T36	1
22	Ceramic disc, .005uF ±20% 100V	CD103-250	SPR	TG-D50	1
25	Ceramic disc, 120pF ±20% 1kV	CD102-112	SPR	5GA-T12	1
34,35	Ceramic disc, 200pF ±20% 1kV	CD102-120	SPR	5GA-T20	2
36	Ceramic disc, 47pF ±5% 1kV	CD104-047	SPR	10TCU-Q47	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm submin.	JF000-005	APL	27-9	2
"CR "	DIODES				
1,2,3	Silicon, P.I.N.	DP000-050	W-I	DP000-050	3
4,5,6,7	Voltage variable capacitance	DC000-008	W-I	DC000-008	4
8	Silicon, Hot Carrier	DG000-007	W-I	DG000-007	1
9,10	Silicon, Junction, 100piV, 750mA	DR000-001	ITT	1N4002	2
"L "	INDUCTORS				
1,4,5,9,11	Fixed,----	LA006-010	W-I	LA006-010	5
2,3	Fixed, ----	Not Assign.	W-I	----------	--
6,7,8,10	Fixed, ----	LA006-004	W-I	LA006-004	4
12	Fixed, 10mH	LA004-310	JEF	15S103K	1
"R "	RESISTORS				
1,5,9,26	Fixed, comp., 47ohm ±10% ¼W	RC104-047	A-B	CB4701	4
2	Fixed, comp., 330ohm ±10% ¼W	RC104-133	A-B	CB3311	1
3,33,46	Fixed, comp., 1kohm ±10% ¼W	RC104-210	A-B	CB1021	3
4	Not Assigned	---------	---	----------	--
6	Fixed, comp., 150ohm ±10% ¼W	RC104-115	A-B	CB1511	1
7,10,30	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	3
8,11,50	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1011	3
12,21	Fixed, comp., 27ohm ±10% ¼W	RC104-027	A-B	CB2701	2
13	Fixed, comp., 470ohm ±5% ¼W	RC103-147	A-B	CB4715	1
14,17,22,25	Fixed, comp., 10ohm ±5% ¼W	RC103-010	A-B	CB1005	4
15,19,20	Fixed, comp., 82ohm ±5% ¼W	RC103-082	A-B	CB8205	3
16	Fixed, comp., 1.5kohm ±5% ¼W	RC103-215	A-B	CB1525	1
18	Fixed, comp., 22ohm ±10% ¼W	RC104-022	A-B	CB2201	1
23	Fixed, comp., 360ohm ±5% ½W	RC105-136	A-B	EB3615	1

PARTS LIST — MODULE M10H & M10H-1 REV E

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
24	Fixed, comp., 150ohm ±5% 1W	RC107-115	A-B	GB1515	1
27,28,31	Fixed, comp., 33kohm ±10% ¼W	RC104-333	A-B	CB3331	3
29	Fixed, comp., 100ohm ±5% 1W	RC107-110	A-B	GB1015	1
32	Fixed, comp., 100kohm ±10% ¼W	RC104-410	A-B	CB1041	1
34,(38),47	Fixed, comp., 10kohm ±10% ¼W	RC104-310	A-B	CB1031	3
35	Fixed, comp., 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1
36	Fixed, comp., 3.3Mohm ±10% ¼W	RC104-522	A-B	CB2251	1
37,39	Variable, carbon 20kohm ±20% ¼W	RC104-320	A-B	WA2G032	2
38	Fixed, comp., 15kohm ±10% ¼W	RC104-315	A-B	CB1531	1
40	Fixed, comp., 470kohm ±10% ¼W	RC104-447	A-B	CB4741	1
(40)	Fixed, comp., 220kohm ±10% ¼W	RC104-422	A-B	CB2241	1
41	Fixed, comp., 1.2kohm ±10% ¼W	RC104-212	A-B	CB1221	1
42	Fixed, comp., 680kohm ±10% ¼W	RC104-468	A-B	CB6841	1
43	Fixed, comp., 2.7kohm ±10% ¼W	RC104-227	A-B	CB2721	1
44,52	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	2
45,51	Fixed, comp., 4.7kohm ±10% ¼W	RC104-247	A-B	CB4721	2
(48)	Fixed, comp., 1.2Mohm ±10% ¼W	RC104-512	A-B	CB1251	1
49	Fixed, comp., 47kohm ±10% ¼W	RC104-347	A-B	CB4731	1
53	Fixed, comp., 150kohm ±10% ¼W	RC104-415	A-B	CB1541	1
"Q "	TRANSISTORS				
1,2,4	NPN, Silicon	QB000-013	AER	A430	3
3,5,6	NPN, Silicon	QB000-018	SSS	SD1006	3
7,10,11	PNP. Silicon	QB000-009	MOT	MPS3702	3
8	N-channel JFET, Silicon	QA054-580	MOT	2N5458	1
9	NPN, Silicon, dual	QB000-010	SPR	TD101	1

SWEEP OSCILLATOR SCHEMATIC

BAND 2 & 3

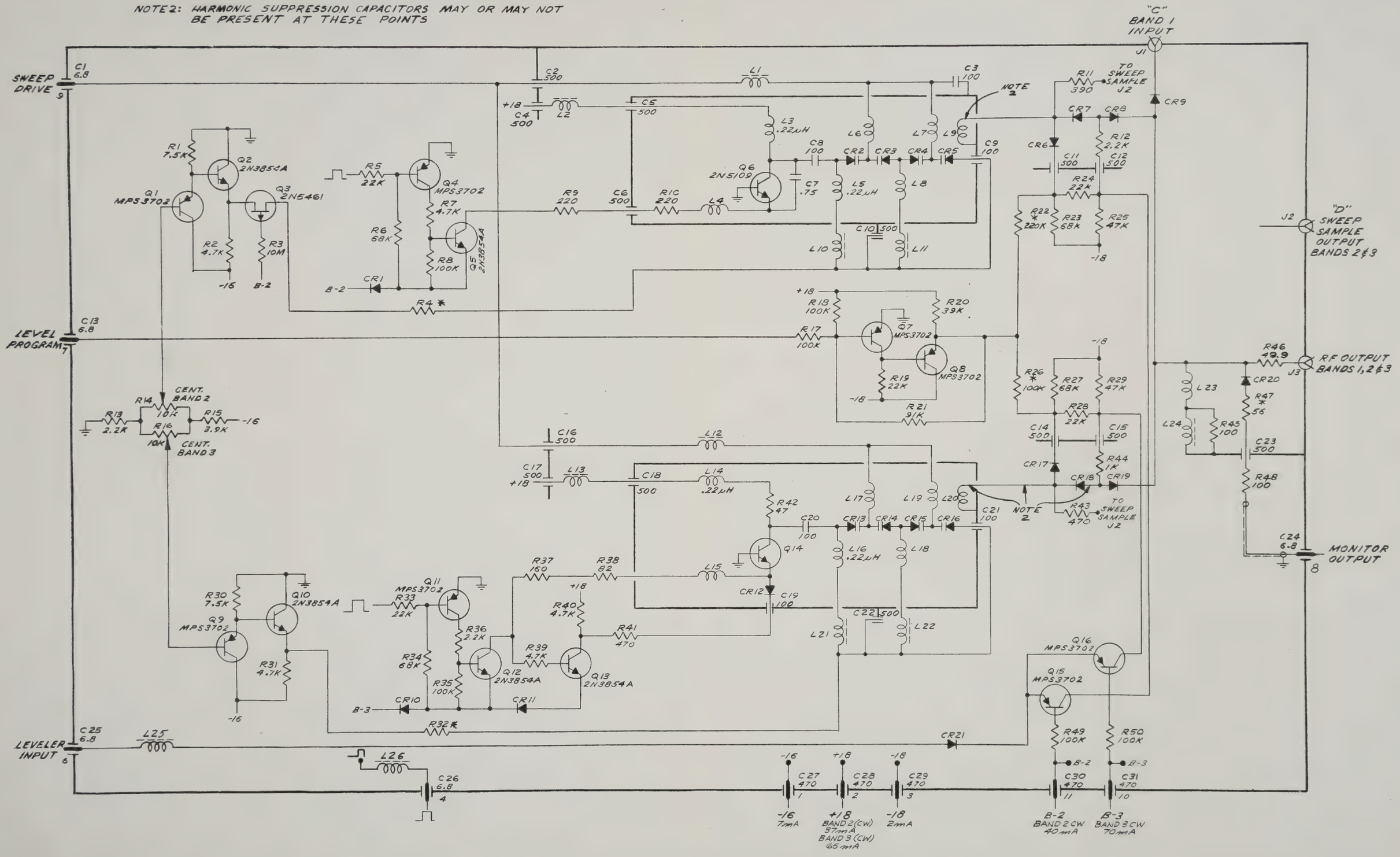
MODULE M19H

"A" VERSION (SEE NOTE 1)

REV E

NOTE 1: "A" VERSION> CHANGES OUTPUT IMPEDANCE TO 75Ω. PARTS AFFECTED ARE R46, R47, & J3 (SEE PARTS LIST)

NOTE 2: HARMONIC SUPPRESSION CAPACITORS MAY OR MAY NOT BE PRESENT AT THESE POINTS



PARTS LIST — MODULE M19H REV F

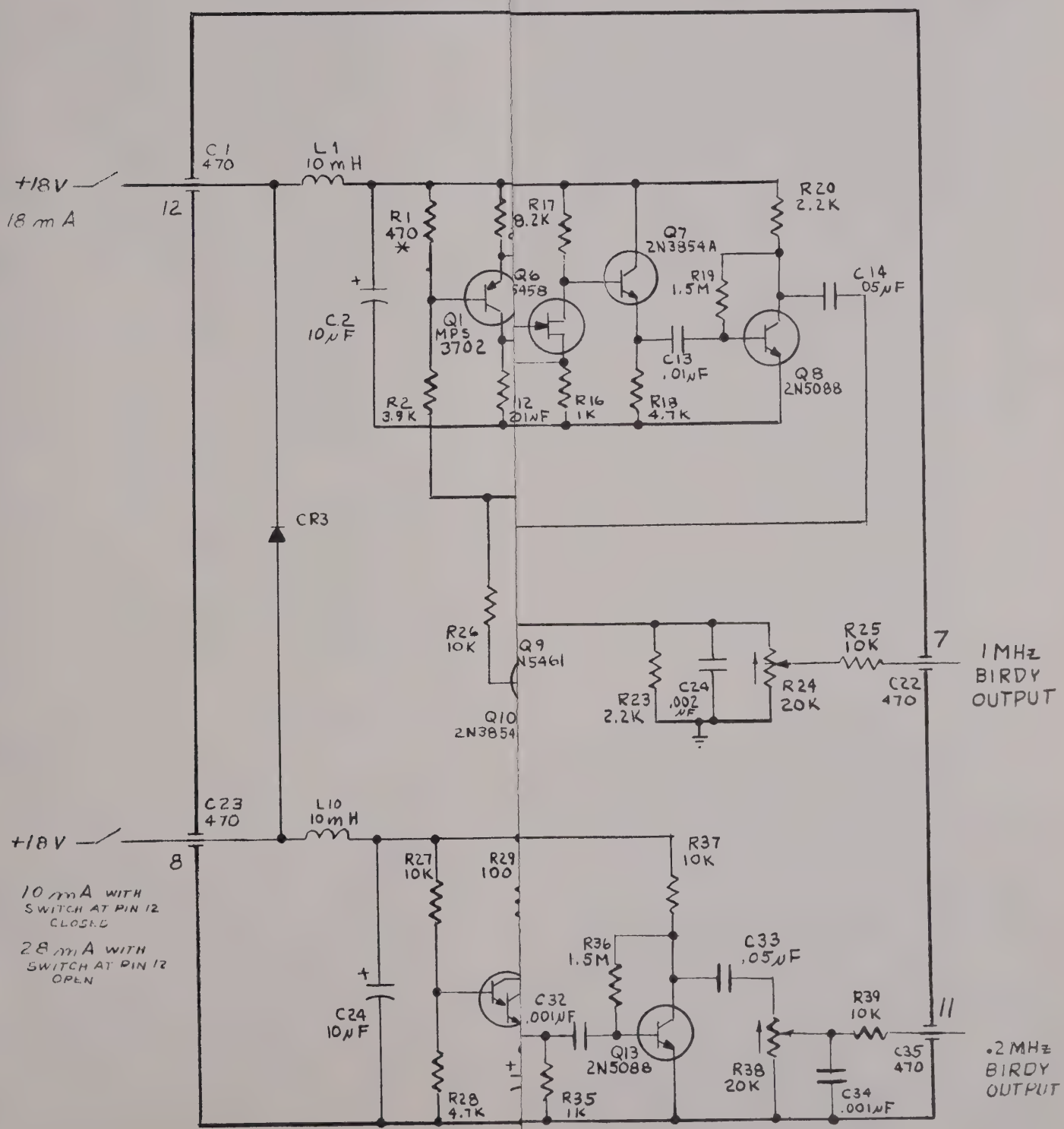
REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
21	Fixed, comp. 91kohm ±5% ¼W	RC103-391	A-B	CB9135	1
25,29	Fixed, comp. 47kohm ±10% ¼W	RC104-347	A-B	CB4731	2
32*	Fixed, comp. 6.8kohm ±10% ¼ W	RC104-268	A-B	CB6821	1
37	Fixed, comp. 160ohm ±5% 1W	RC107-116	A-B	GB1615	1
38	Fixed, comp. 82ohm ±10% ½W	RC106-082	A-B	EB8201	1
41	Fixed, comp. 470ohm ±10% 1W	RC108-147	A-B	GB4711	1
42	Fixed, comp. 47ohm ±10% ¼W	RC104-047	A-B	CB4701	1
43	Fixed, comp. 470ohm ±10% ¼W	RC104-147	A-B	CB4711	1
44	Fixed, comp. 1kohm ±10% ¼W	RC104-210	A-B	CB1021	1
45,48	Fixed, comp. 100ohm ±10% ¼W	RC104-110	A-B	CB1011	2
46	Metal Film, 49.9 ohm ±1%	RF404-990	E-M	MF5C1%TO	1
47	Fixed, comp. 56ohm ±10% ¼W	RC104-056	A-B	CB5601	1
"Q "	TRANSISTORS				
1,4,7,8,9, 11,15,16	NPN, Silicon	QB000-009	MOT	MPS3702	8
2,5,10,12,13	NPN, Silicon	QA038-541	G-E	2N3854A	5
3	P-channel JFET	QA054-610	MOT	2N5461	1
6	NPN, Silicon	QA051-090	SSS	2N5109	1
14	NPN, Silicon	QB000-015	W-I	QB000-015	1
	PARTS SUBSTITUTED FOR M19HA (75 ohm Module)				
"J "	CONNECTORS (JACKS)				
3	Jack, 75 ohm subminiature	JF000-004	APL	27-21	1
"R "	RESISTORS				
46	Metal Film, 75 ohm ±1%	RF407-500	E-M	MF5C1%TO	1
47*	Composition, 75 ohm ±10% ¼ W	RC104-075	A-B	CB7501	1

ARMONIC MARKER SCHEMATIC

INTERVAL : .2 MHz AND 1 MHz

M66H.2,1-1

REV B



PARTS LIST — MODULE M19H REV F

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,13,24,25 26	Ceramic feedthru 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	5
2,4,5,6,10 11,12,14, 15,16,17,18 22,23	Ceramic feedthru 500pF ±20% 250V	CF104-150	AER	EF4	14
3,8,9,19,20, 21	Ceramic feedthru 100pF ±20% 250V	CF104-110	AER	EF4	6
7	Composition .75pF ±10% 500V	CG101-175	Q-C	QC.75	1
27,28,29,30 31	Ceramic feedthru 470pF ±20% 500V	CF101-147	A-B	FA5C	5
Note 2	Composition, from .2pF to 1pF	CG102----	Q-C	QC	--
"J "	CONNECTORS				
1,2,3	Jack, receptacle, 50ohm submin	JF000-005	APL	27-9	3
"CR "	DIODES				
1,10,11,21	Silicon, Junction 100piV, 750mA	DR000-001	DIO	1N4004	4
2,3,4,5,13 14,15,16	Voltage variable capacitance	DC000-008	W-I	DC000-008	8
6,7,8,9,12 17,18,19	Silicon, P.I.N.	DP000-040	W-I	DP000-040	8
20	Silicon, point contact	DG100-821	G-I	1N82AS	1
"L "	INDUCTORS				
1,2,10,11,12 13,21,22	4 Turn Toriod	LA006-004	W-I	LA006-004	8
3,5,14,16	Fixed, .22uH	LA005-R02	ASE	08NR47K	4
4,7,8,15 17,18,19	Fixed, -----	Not assign.	W-I	Not assign.	--
6	Fixed, -----	Not assign.	W-I	Not assign.	--
9,20	Fixed, -----	Not assign.	W-I	Not assign.	--
23	Fixed, -----	Not assign.	W-I	Not assign.	--
24	10 Turn Toroid	LA006-010	W-I	LA006-010	1
25,26	4 Turn Toroid	LA007-004	W-I	LA007-004	2
"R "	RESISTORS				
1,30	Fixed, comp. 7.5kohm ±5% ¼W	RC103-275	A-B	CB7525	2
2,7,31,39 40	Fixed, comp. 4.7kohm ±10% ¼W	RC104-247	A-B	CB4721	5
3	Fixed, comp. 10Mohm ±10% ¼W	RC104-610	A-B	CB1061	1
4,22,26	Fixed, adjustable, nominal value shown	RC104----	---	------	-
5,19,24,28 33	Fixed, comp. 22kohm ±10% ¼W	RC104-322	A-B	CB2231	5
6,23,27,34	Fixed, comp. 68kohm ±10% ¼W	RC104-368	A-B	CB6831	4
8,17,18,35 49,50	Fixed, comp. 100kohm ±10% ¼W	RC104-410	A-B	CB1041	6
9,10	Fixed, comp. 220ohm ±10% ½W	RC106-122	A-B	EB2211	2
11	Fixed, comp. 390ohm ±10% ¼W	RC104-139	A-B	CB3911	1
12,13,36	Fixed, comp. 2.2kohm ±10% ¼W	RC104-222	A-B	CB2221	3
14,16	Variable, wire wound 10kohm	RV102-310	BOU	3067P	2
15	Fixed, comp. 3.9kohm ±10% ¼W	RC104-239	A-B	CB3921	1
20	Fixed, comp. 39kohm ±10% ¼W	RC104-339	A-B	CB3931	1

PARTS LIST — MODULE M19H REV F

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
21	Fixed, comp. 91kohm ±5% ¼W	RC103-391	A-B	CB9135	1
25,29	Fixed, comp. 47kohm ±10% ¼W	RC104-347	A-B	CB4731	2
32*	Fixed, comp. 6.8kohm ±10% ¼ W	RC104-268	A-B	CB6821	1
37	Fixed, comp. 160ohm ±5% 1W	RC107-116	A-B	GB1615	1
38	Fixed, comp. 82ohm ±10% ½W	RC106-082	A-B	EB8201	1
41	Fixed, comp. 470ohm ±10% 1W	RC108-147	A-B	GB4711	1
42	Fixed, comp. 47ohm ±10% ¼W	RC104-047	A-B	CB4701	1
43	Fixed, comp. 470ohm ±10% ¼W	RC104-147	A-B	CB4711	1
44	Fixed, comp. 1kohm ±10% ¼W	RC104-210	A-B	CB1021	1
45,48	Fixed, comp. 100ohm ±10% ¼W	RC104-110	A-B	CB1011	2
46	Metal Film, 49.9 ohm ±1%	RF404-990	E-M	MF5C1%TO	1
47	Fixed, comp. 56ohm ±10% ¼W	RC104-056	A-B	CB5601	1
"Q "	TRANSISTORS				
1,4,7,8,9, 11,15,16	NPN, Silicon	QB000-009	MOT	MPS3702	8
2,5,10,12,13	NPN, Silicon	QA038-541	G-E	2N3854A	5
3	P-channel JFET	QA054-610	MOT	2N5461	1
6	NPN, Silicon	QA051-090	SSS	2N5109	1
14	NPN, Silicon	QB000-015	W-I	QB000-015	1
	PARTS SUBSTITUTED FOR M19HA (75 ohm Module)				
"J "	CONNECTORS (JACKS)				
3	Jack, 75 ohm subminiature	JF000-004	APL	27-21	1
"R "	RESISTORS				
46	Metal Film, 75 ohm ±1%	RF407-500	E-M	MF5C1%TO	1
47*	Composition, 75 ohm ±10% ¼ W	RC104-075	A-B	CB7501	1

HARMONIC MARKER SCHEMATIC

INTERVAL : .2 MHz AND 1 MHz

M66H.2,1-1

REV B

+18V
18 mA
12
C1 470
L1 10 mH
R1 470 *
R2 3.9K
R3 2.2K
R4 2.2K
C2 10 μF
C3 .01μF *
C4 33
X1
Q1 MPS 3702
R5 27K
R6 3.9K
R7 470
R8 10K
C5 .01μF
Q2 2N 3854A
R40 470
C35 .025μF
Q3 MPS 3702
T.P.1
R41 470
C6 68
L2
160t
20t
C7 100
Q4 2N5179
L3
35t
10t
CR1
R9 82
Q5 A430
C9 15
L4
R10 75
C8 3.5/13
L6
C10 47
CR2 1N824S
R11 3.3K
L5
R12 470
SWEEP SAMPLE IN
SWEEP SAMPLE OUT
J1
J2
R13 12K
R14 1M
C11 .001μF
R15 15K
R17 8.2K
Q6 2N5458
C12 .01μF
R16 1K
Q7 2N3854A
R19 1.5M
C13 .01μF
R18 4.7K
R20 2.2K
Q8 2N5088
C14 .05μF
CR3
R26 10K
Q10 2N3854A
L7 510nH
L8 510nH
L9 510nH
R21 100K
C15 470
C16 270
C17 470
C18 270
C19 470
C20 470
Q9 2N5461
R22 10M
R23 2.2K
C24 .002 μF
R24 20K
R25 10K
C22 470
7
1MHz BIRDY OUTPUT
+18V
8
10 mA WITH SWITCH AT PIN 12 CLOSED
28 mA WITH SWITCH AT PIN 12 OPEN
C23 470
L10 10 mH
R27 10K
R29 100
C24 10 μF
Q11 2N5306
R28 4.7K
C25 10 μF
R30 2.7K
44V
(÷10)
IC 1 NB292A
8 9 10 11 12 13 14
7 6 5 4 3 2 1
R31 3.3K
R32 3.3K
C26 270
R33 2.7K
Q12 2N 3854A
R34 10K
C27 100
CR4 1N34
L11 10 nH
CR5 1N824S
L12 510nH
L13 10 mH
L14 10 mH
L15 10 mH
C28 .01μF
C29 .01μF
C30 .01μF
C31 .01μF
C32 .001μF
R35 1K
R36 1.5M
Q13 2N5088
R37 10K
C33 .05μF
R38 20K
R39 10K
C34 .001μF
C35 470
11
.2 MHz BIRDY OUTPUT

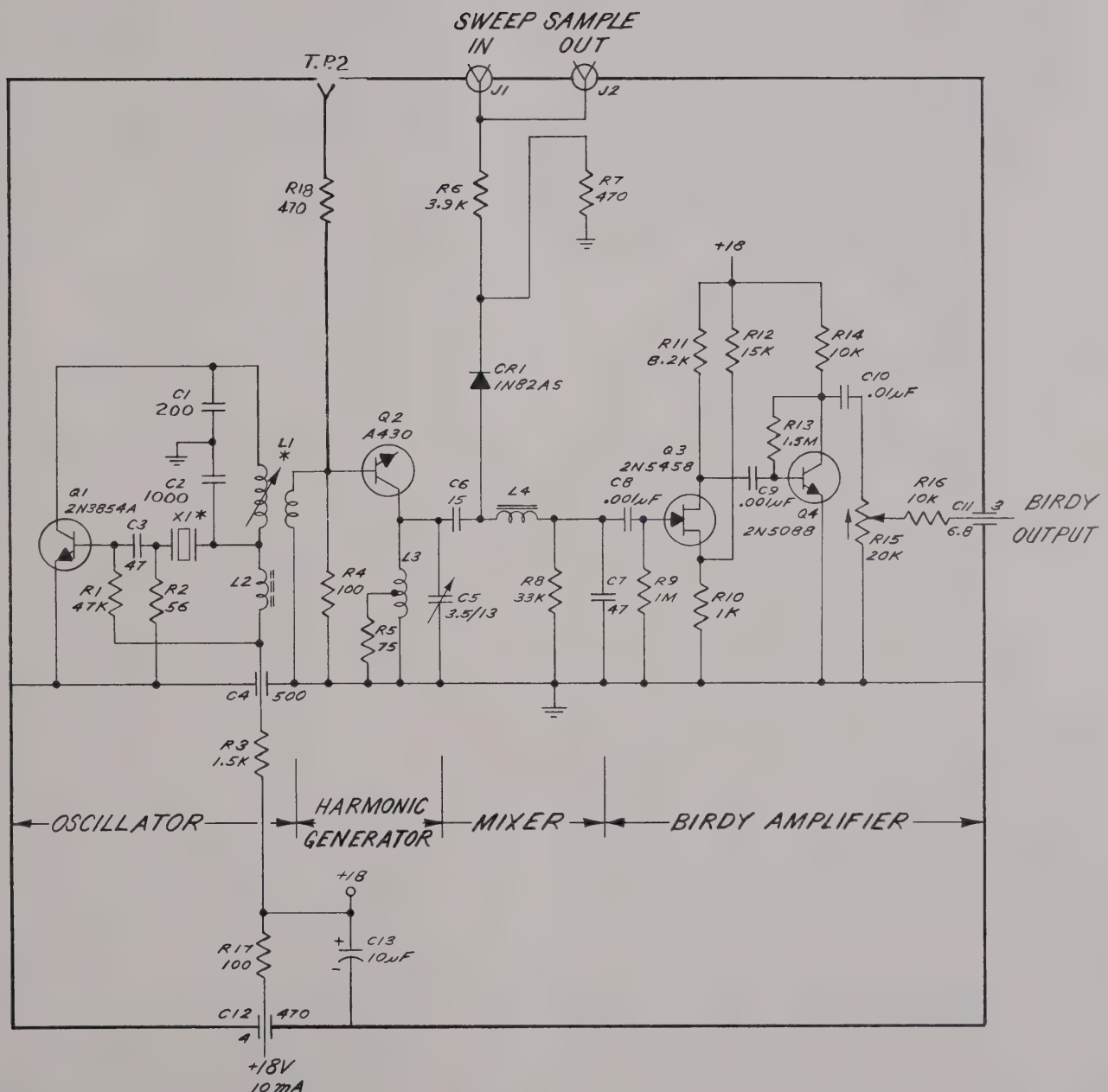
PARTS LIST

MODULE M66H .2,1-1 REV B

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R"	RESISTORS				
5	Fixed, comp. 27k ohm ±10% ¼W	RC104-327	A-B	CB2731	1
8,25,34,37					
39	Fixed, comp. 10k ohm ±10% ¼W	RC104-310	A-B	CB1031	5
9	Fixed, comp. 82 ohm ±10% ¼W	RC104-082	A-B	CB8201	1
10	Fixed, comp. 75 ohm ±5% ¼W	RC103-075	A-B	CB7505	1
11,31,32	Fixed, comp. 3.3k ohm ±10% ¼W	RC104-233	A-B	CB3321	3
13	Fixed, comp. 12k ohm ±-0% ¼W	RC104-312	A-B	CB1231	1
14	Fixed, comp. 1M ohm ±10% ¼W	RC104-510	A-B	CB1051	1
15	Fixed, comp. 15k ohm ±10% ¼W	RC104-315	A-B	CB1531	1
16,35	Fixed, comp. 1k ohm ±10% ¼W	RC104-210	A-B	CB1021	2
17	Fixed, comp. 8.2k ohm ±10% ¼W	RC104-282	A-B	CB8221	1
18	Fixed, comp. 4.7k ohm ±10% ¼W	RC104-247	A-B	CB4721	1
19,36	Fixed, comp. 1.5M ohm ±10% ¼W	RC104-515	A-B	CB1551	2
21	Fixed, comp. 100k ohm ±10% ¼W	RC104-410	A-B	CB1041	1
22	Fixed, comp. 100M ohm ±10% ¼W	RC104-710	A-B	CB1071	1
24,38	Variable, carbon 20k ohm ±20% ¼W	RP124-320	A-B	WA2G032	2
27	Fixed, comp. 10k ohm ±5% ¼W	RC103-310	A-B	CB1035	1
28	Fixed, comp. 4.7k ohm ±5% ¼W	RC103-247	A-B	CB4725	1
29	Fixed, comp. 100 ohm ±10% ¼W	RC104-110	A-B	CB1011	1
30,33	Fixed, comp. 2.7k ohm ±10% ¼W	RC104-227	A-B	CB2721	2
"Q"	TRANSISTORS				
1,3	PNP, Silicon	QB000-009	MOT	MPS3702	2
2,7,10,12	NPN, Silicon	QA038-541	G-E	2N3854A	4
4	NPN, Silicon	QA051-790	RCA	2N5179	1
5	NPN, Silicon	QB000-013	APX	A430	1
6	N-channel JFET	QA054-580	MOT	2N5458	1
8,13	NPN, Silicon	QA050-880	MOT	2N5088	2
9	P-channel JFET	QA054-610	MOT	2N5461	1
11	Darlington NPN Silicon	QA053-060	G-E	2N5306	1

HARMONIC MARKER SCHEMATIC
(OPTION A2) INTERVAL: 5 MHz
MODULE M6H 5-1

REV A



PARTS LIST — MODULE M66H .2,1-1 REV B

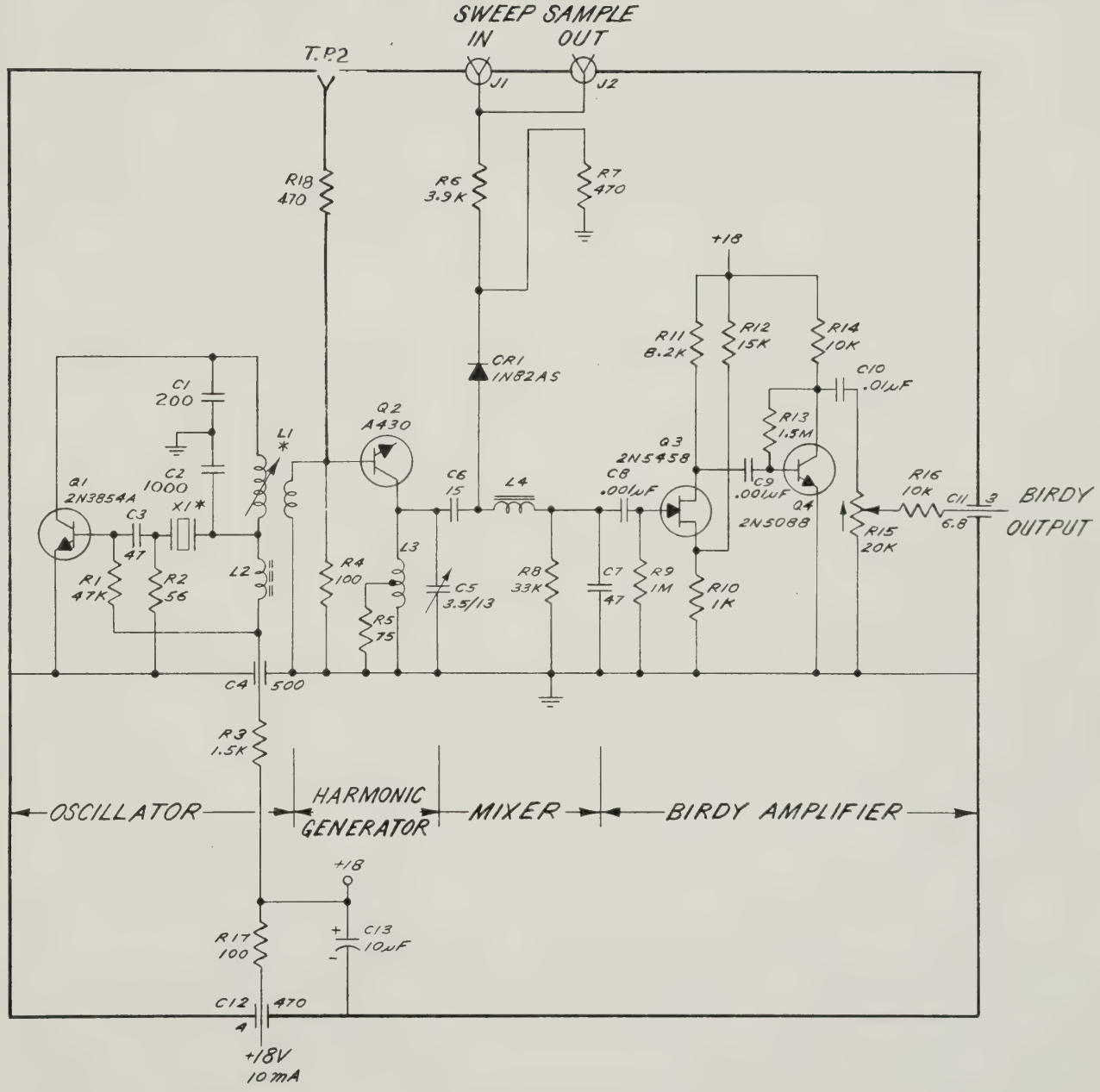
REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,22,23,35	Ceramic feedthru 470pF ±20% 500V	CF101-147	A-B	FA5C	4
2,24,25	Electrolytic 10uF 25V	CE105-010	SPR	TE1204	3
3,5,12,13,28	Ceramic disc .01uF ±20% 100V	CD103-310	SPR	TG-S10	8
29,30,31					
4	Ceramic disc 33pF ±5% 1kV	CD104-033	SPR	10TCU-Q33	1
6	Ceramic disc 68pF ±5% 1kV	CD104-068	SPR	10TCU-Q68	1
7	Ceramic disc 100pF ±5% 1kV	CD104-110	SPR	10TCU-T10	1
8	Variable, ceramic 3.5/13	CV101-013	STE	S-TRIKO	1
9	Ceramic disc 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
10	Ceramic disc 47pF ±5% 1kV	CD104-047	SPR	10TCU-Q47	1
11,32,34	Ceramic disc .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	3
14,33	Ceramic disc .05uF ±20% 100V	CD103-350	SPR	TG-S50	2
15,17,19,20	Ceramic disc 470pF ±20% 1kV	CD102-147	SPR	5GA-T47	4
16,18,26	Ceramic disc 270pF ±20% 1kV	CD102-127	SPR	5GA-T27	3
21	Ceramic disc .002uF ±20% 1kV	CD102-220	SPR	5GA-D20	1
27	Ceramic disc 100pF ±20% 1kV	CD102-110	SPR	5GA-T10	1
35	Ceramic disc .025uF ±20% 100V	CD103-325	SPR	TG-S25	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50 ohm submin	JF000-005	APL	27-9	2
3	Pin socket, teflon	MC000-002	W-I	MC000002	1
"X "	CRYSTALS				
1	1 MHz	Y-1	W-I	Y-1	1
"CR "	DIODES				
1	Silicon, Hot carrier	DG000-007	H-P	5082-2800	1
2,5	Silicon, Point contact	DG100-821	SYL	1N82AS	2
3	Silicon, Junction	DR000-001	ITT	1N4002	1
4	Germanium, Point contact	DG100-341	SYL	1N34AS	1
"L "	INDUCTORS				
1,10,13,14	Fixed, 10mH	LA004-310	JEF	15S	5
15					
2	Coil form LB002-000 with 160 turns, 20 turns #32 gauge magnet wire	Not assign.	W-I	----------	-
3	Coil form LB003-000 with 35 turns, 15 turns #32 gauge magnet wire	Not assign.	W-I	----------	-
4	24 gauge buss wire	Not assign.	W-I	----------	-
5	Fixed, ---	LA006-010	W-I	LA006-010	1
6	Fixed, ---	LA006-004	W-I	LA006-004	1
7,8,9,12	Fixed, 510uH	LA002-151	JEF	19	4
11	Fixed, 10uH	LA001-010	JEF	15	1
"IC "	INTEGRATED CIRCUITS				
1	Decade counter	IC000-003	SIG	N8292A	1
"R "	RESISTORS				
1,12,7,40,41	Fixed, comp. 470 ohm ±10% ¼W	RC104-147	A-B	CB4711	5
2,6	Fixed, comp. 3.9k ohm ±10% ¼W	RC104-239	A-B	CB3921	2
3,4,20,23	Fixed, comp. 2.2k ohm ±10% ¼W	RC104-222	A-B	CB2221	4

PARTS LIST — MODULE M66H .2,1-1 REV B

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
5	Fixed, comp. 27k ohm ±10% ¼W	RC104-327	A-B	CB2731	1
8,25,34,37					
39	Fixed, comp. 10k ohm ±10% ¼W	RC104-310	A-B	CB1031	5
9	Fixed, comp. 82 ohm ±10% ¼W	RC104-082	A-B	CB8201	1
10	Fixed, comp. 75 ohm ±5% ¼W	RC103-075	A-B	CB7505	1
11,31,32	Fixed, comp. 3.3k ohm ±10% ¼W	RC104-233	A-B	CB3321	3
13	Fixed, comp. 12k ohm ±-0% ¼W	RC104-312	A-B	CB1231	1
14	Fixed, comp. 1M ohm ±10% ¼W	RC104-510	A-B	CB1051	1
15	Fixed, comp. 15k ohm ±10% ¼W	RC104-315	A-B	CB1531	1
16,35	Fixed, comp. 1k ohm ±10% ¼W	RC104-210	A-B	CB1021	2
17	Fixed, comp. 8.2k ohm ±10% ¼W	RC104-282	A-B	CB8221	1
18	Fixed, comp. 4.7k ohm ±10% ¼W	RC104-247	A-B	CB4721	1
19,36	Fixed, comp. 1.5M ohm ±10% ¼W	RC104-515	A-B	CB1551	2
21	Fixed, comp. 100k ohm ±10% ¼W	RC104-410	A-B	CB1041	1
22	Fixed, comp. 100M ohm ±10% ¼W	RC104-710	A-B	CB1071	1
24,38	Variable, carbon 20k ohm ±20% ¼W	RP124-320	A-B	WA2G032	2
27	Fixed, comp. 10k ohm ±5% ¼W	RC103-310	A-B	CB1035	1
28	Fixed, comp. 4.7k ohm ±5% ¼W	RC103-247	A-B	CB4725	1
29	Fixed, comp. 100 ohm ±10% ¼W	RC104-110	A-B	CB1011	1
30,33	Fixed, comp. 2.7k ohm ±10% ¼W	RC104-227	A-B	CB2721	2
"Q "	TRANSISTORS				
1,3	PNP, Silicon	QB000-009	MOT	MPS3702	2
2,7,10,12	NPN, Silicon	QA038-541	G-E	2N3854A	4
4	NPN, Silicon	QA051-790	RCA	2N5179	1
5	NPN, Silicon	QB000-013	APX	A430	1
6	N-channel JFET	QA054-580	MOT	2N5458	1
8,13	NPN, Silicon	QA050-880	MOT	2N5088	2
9	P-channel JFET	QA054-610	MOT	2N5461	1
11	Darlington NPN Silicon	QA053-060	G-E	2N5306	1

HARMONIC MARKER SCHEMATIC
(OPTION A2) INTERVAL: 5 MHz
MODULE M6H 5-1

REV A

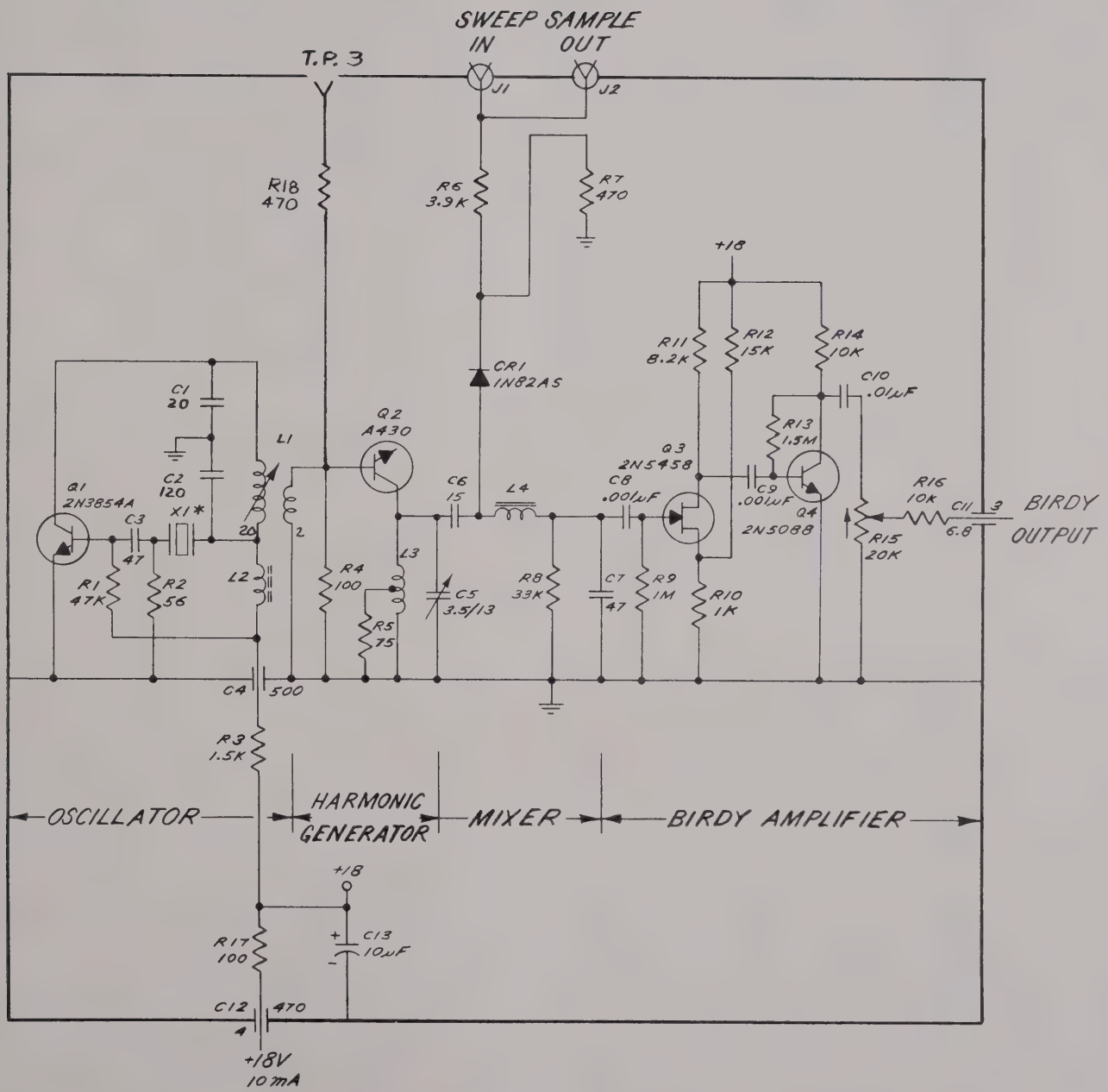


PARTS LIST

MODULE M6H 5-1 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
" C "	CAPACITORS				
1	Ceramic disc, pF ± 5% 1kV	CD104-120	SPR	10TCC-T20	1
2	Silvered mica, 1000pF± 5%	CM101-210	A-E	DM-19-102J	1
3,7	Ceramic disc, 47pF ±5% 1kV	CD104-047	SPR	10TCC-Q47	2
4	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	1
5	Variable, ceramic, 3.5/13pF	CV101-013	STR	7STRIKO-02	1
6	Ceramic disc, 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
8,9	Ceramic disc, .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	2
10	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	1
11	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	1
12	Ceramic feedthru, 470pF ±20% 500V	CF101-141	A-B	FA5C	1
13	Electrolytic, 10uF 25V	CE105-010	SPR	TE1204	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm submin	JF000-005	APL	27-9	2
3	Pin socket, teflon	MC000-002	W-I	MC-000-002	1
"X "	CRYSTALS				
1	5MHz	Y- 5, 5.0	W-I	Y-5,5.0	1
"CR "	DIODES				
1	Silicon, point contact	DG100-821	SYL	IN82AS	1
"L "	INDUCTORS				
1	Coilform LB-003-000 with 35 turns, 5 turns of 32 gage magnet wire	Not Assign.	---	----------	--
2	Fixed---	LA006-010	W-I	LA006-010	1
3	Formed from 24 ga. buss wire	Not Assign	----	----------	--
4	Fixed---	LA006-004	W-I	LA006-004	1
"R "	RESISTORS				
1	Fixed, comp., 47kohm ±10% ¼W	RC104-347	A-B	CB4731	1
2	Fixed, comp., 56ohm ±10% ¼W	RC104-056	A-B	CB5601	1
3	Fixed, comp., 1.5kohm ±10% ¼W	RC104-215	A-B	CB1521	1
4,17	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1021	2
5	Fixed, comp., 75ohm ±5% ¼W	RC103-075	A-B	CB7505	1
6	Fixed, comp., 3.9kohm ±10% ¼W	RC104-239	A-B	CB3921	1
7,18	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	2
8	Fixed, comp., 33kohm ±10% ¼W	RC104-333	A-B	CB3331	1
9	Fixed, comp., 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1
10	Fixed, comp., 1kohm ±10% ¼W	RC104-210	A-B	CB1021	1
11	Fixed, comp., 8.2kohm ±10% ¼W	RC104-282	A-B	CB8221	1
12	Fixed, comp., 15kohm ±10% ¼W	RC104-315	A-B	CB1531	1
13	Fixed, comp., 1.5Mohm ±10% ¼W	RC104-515	A-B	CB1551	1
14,16	Fixed, comp., 10kohm ±10% ¼W	RC104-310	A-B	CB1031	2
15	Variable, carbon, 20kohm ±20% ¼W	RP124-320	A-B	WA2G032	1
"Q "	TRANSISTORS				
1	NPN, Silicon	QA038-541	G-E	2N3854A	1
2	NPN, Silicon	QB000-013	APX	A430	1
3	N-channel JFET	QA054-580	MOT	2N5458	1
4	NPN, Silicon	QA050-880	MOT	2N5088	1

HARMONIC MARKER SCHEMATIC
INTERVAL: 20 MHz
MODULE M6H 20-1
REV A

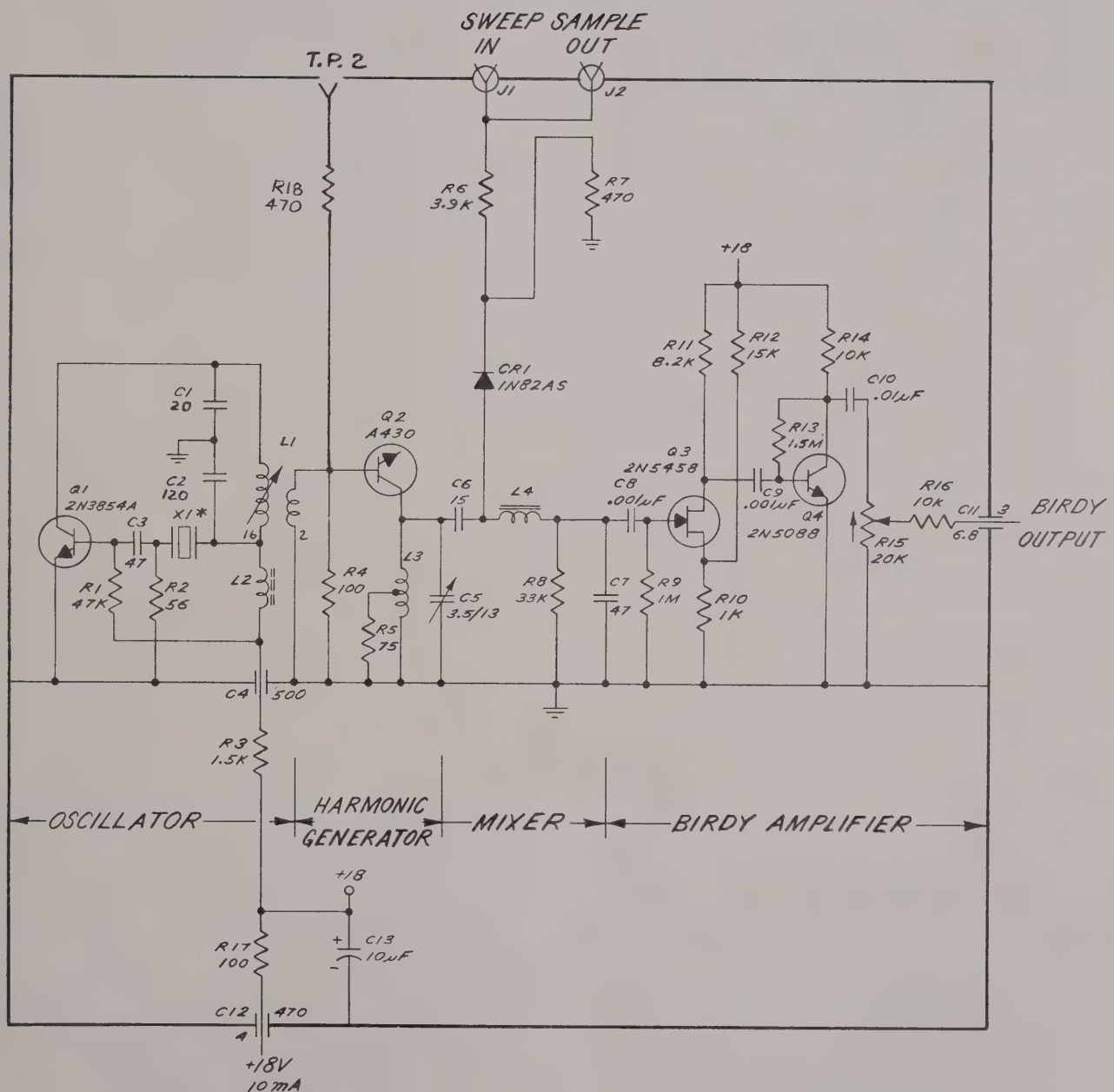


PARTS LIST

MODULE M6H 20-1REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
" C "	CAPACITORS				
1	Ceramic disc, 20 pF ± 5% 1kV	CD101-020	SPR	10TCU-Q20	1
2	Ceramic disc, 120 pF ± 5% 1kV	CD104-112	SPR	10TCC-T12	1
3,7	Ceramic disc, 47pF ±5% 1kV	CD104-047	SPR	10TCC-Q47	2
4	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	1
5	Variable, ceramic, 3.5/13pF	CV101-013	STR	7STRIKO-02	1
6	Ceramic disc, 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
8,9	Ceramic disc, .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	2
10	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	1
11	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	1
12	Ceramic feedthru, 470pF ±20% 500V	CF101-141	A-B	FA5C	1
13	Electrolytic, 10uF 25V	CE105-010	SPR	TE1204	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm submin	JF000-005	APL	27-9	2
3	Pin socket, teflon	MC000-002	W-I	MC-000-002	1
"X "	CRYSTALS				
1	20MHz	Y-7	W-I	Y-7	1
"CR "	DIODES				
1	Silicon, point contact	DG100-821	SYL	IN82AS	1
"L "	INDUCTORS				
1	Coilform LB-003-000 with 20 turns, 2 turns of 32 gage magnet wire	Not Assign.	---	----------	--
2	Fixed---	LA006-010	W-I	LA006-010	1
3	Formed from 24 ga. buss wire	Not Assign	---	----------	--
4	Fixed---	LA006-004	W-I	LA006-004	1
"R "	RESISTORS				
1	Fixed, comp., 47kohm ±10% ¼W	RC104-347	A-B	CB4731	1
2	Fixed, comp., 56ohm ±10% ¼W	RC104-056	A-B	CB5601	1
3	Fixed, comp., 1.5kohm ±10% ¼W	RC104-215	A-B	CB1521	1
4,17	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1021	2
5	Fixed, comp., 75ohm ±5% ¼W	RC103-075	A-B	CB7505	1
6	Fixed, comp., 3.9kohm ±10% ¼W	RC104-239	A-B	CB3921	1
7,18	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	2
8	Fixed, comp., 33kohm ±10% ¼W	RC104-333	A-B	CB3331	1
9	Fixed, comp., 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1
10	Fixed, comp., 1kohm ±10% ¼W	RC104-210	A-B	CB1021	1
11	Fixed, comp., 8.2kohm ±10% ¼W	RC104-282	A-B	CB8221	1
12	Fixed, comp., 15kohm ±10% ¼W	RC104-315	A-B	CB1531	1
13	Fixed, comp., 1.5Mohm ±10% ¼W	RC104-515	A-B	CB1551	1
14,16	Fixed, comp., 10kohm ±10% ¼W	RC104-310	A-B	CB1031	2
15	Variable, carbon, 20kohm ±20% ¼W	RP124-320	A-B	WA2G032	1
"Q "	TRANSISTORS				
1	NPN, Silicon	QA038-541	G-E	2N3854A	1
2	NPN, Silicon	QB000-013	APX	A430	1
3	N-channel JFET	QA054-580	MOT	2N5458	1
4	NPN, Silicon	QA050-880	MOT	2N5088	1

HARMONIC MARKER SCHEMATIC
INTERVAL: 30 MHz
MODULE M6H 30-1
REV A



PARTS LIST

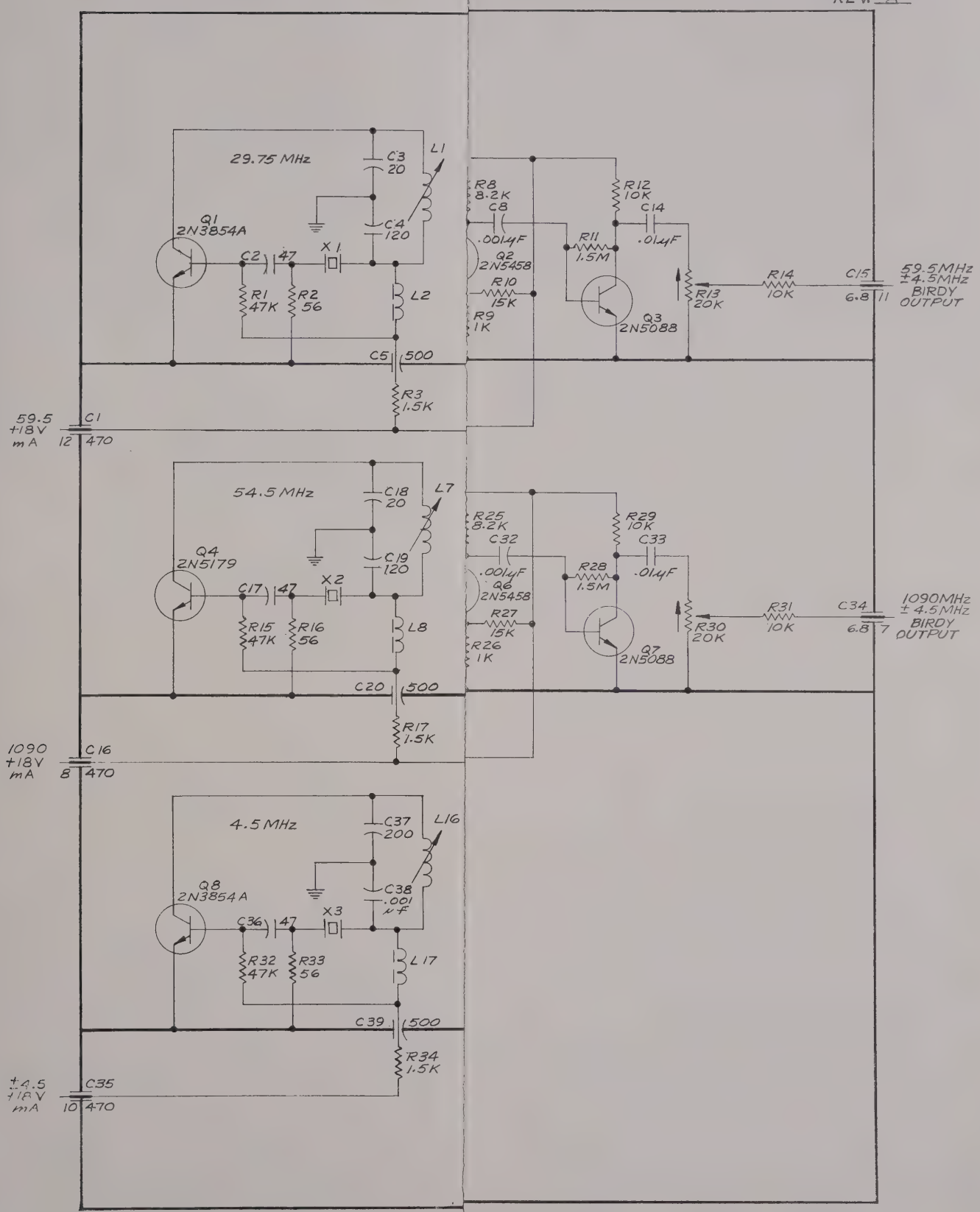
MODULE M6H 30-1REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
" C "	CAPACITORS				
1	Ceramic disc, 20 pF ± 5% 1kV	CD101-020	SPR	10TCU-Q20	1
2	Ceramic disc, 120 pF ± 5% 1kV	CD104-112	SPR	10TCC-T12	1
3,7	Ceramic disc, 47pF ±5% 1kV	CD104-047	SPR	10TCC-Q47	2
4	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	1
5	Variable, ceramic, 3.5/13pF	CV101-013	STR	7STRK0-02	1
6	Ceramic disc, 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
8,9	Ceramic disc, .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	2
10	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	1
11	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	1
12	Ceramic feedthru, 470pF ±20% 500V	CF101-141	A-B	FA5C	1
13	Electrolytic, 10uF 25V	CE105-010	SPR	TE1204	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm submin	JF000-005	APL	27-9	2
3	Pin socket, teflon	MC000-002	W-I	MC-000-002	1
"X "	CRYSTALS				
1	30MHz	Y-4	W-I	Y-4	1
"CR "	DIODES				
1	Silicon, point contact	DG100-821	SYL	IN82AS	1
"L "	INDUCTORS				
1	Coilform LB-003-000 with 16 turns, 2 turns of 32 gage magnet wire	Not Assign.	---	----------	--
2	Fixed---	LA006-010	W-I	LA006-010	1
3	Formed from 24 ga. buss wire	Not Assign.	---	----------	--
4	Fixed---	LA006-004	W-I	LA006-004	1
"R "	RESISTORS				
1	Fixed, comp., 47kohm ±10% ¼W	RC104-347	A-B	CB4731	1
2	Fixed, comp., 56ohm ±10% ¼W	RC104-056	A-B	CB5601	1
3	Fixed, comp., 1.5kohm ±10% ¼W	RC104-215	A-B	CB1521	1
4,17	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1021	2
5	Fixed, comp., 75ohm ±5% ¼W	RC103-075	A-B	CB7505	1
6	Fixed, comp., 3.9kohm ±10% ¼W	RC104-239	A-B	CB3921	1
7,18	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	2
8	Fixed, comp., 33kohm ±10% ¼W	RC104-333	A-B	CB3331	1
9	Fixed, comp., 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1
10	Fixed, comp., 1kohm ±10% ¼W	RC104-210	A-B	CB1021	1
11	Fixed, comp., 8.2kohm ±10% ¼W	RC104-282	A-B	CB8221	1
12	Fixed, comp., 15kohm ±10% ¼W	RC104-315	A-B	CB1531	1
13	Fixed, comp., 1.5Mohm ±10% ¼W	RC104-515	A-B	CB1551	1
14,16	Fixed, comp., 10kohm ±10% ¼W	RC104-310	A-B	CB1031	2
15	Variable, carbon, 20kohm ±20% ¼W	RP124-320	A-B	WA2G032	1
"Q "	TRANSISTORS				
1	NPN, Silicon	QA038-541	G-E	2N3854A	1
2	NPN, Silicon	QB000-013	APX	A430	1
3	N-channel JFET	QA054-580	MOT	2N5458	1
4	NPN, Silicon	QA050-880	MOT	2N5088	1

MARKER SCHEMATIC

M66 59.5/1090/±4.5

REV. A



PARTS LIST

MODULE M6H 30-1REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
" C "	CAPACITORS				
1	Ceramic disc, 20 pF ± 5% 1kV	CD101-020	SPR	10TCU-Q20	1
2	Ceramic disc, 120 pF ± 5% 1kV	CD104-112	SPR	10TCC-T12	1
3,7	Ceramic disc, 47pF ±5% 1kV	CD104-047	SPR	10TCC-Q47	2
4	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	1
5	Variable, ceramic, 3.5/13pF	CV101-013	STR	7STRK0-02	1
6	Ceramic disc, 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
8,9	Ceramic disc, .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	2
10	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	1
11	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	1
12	Ceramic feedthru, 470pF ±20% 500V	CF101-141	A-B	FA5C	1
13	Electrolytic, 10uF 25V	CE105-010	SPR	TE1204	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm submin	JF000-005	APL	27-9	2
3	Pin socket, teflon	MC000-002	W-I	MC-000-002	1
"X "	CRYSTALS				
1	30MHz	Y-4	W-I	Y-4	1
"CR "	DIODES				
1	Silicon, point contact	DG100-821	SYL	IN82AS	1
"L "	INDUCTORS				
1	Coilform LB-003-000 with 16 turns, 2 turns of 32 gage magnet wire	Not Assign.	---	----------	--
2	Fixed---	LA006-010	W-I	LA006-010	1
3	Formed from 24 ga. buss wire	Not Assign.	---	----------	--
4	Fixed---	LA006-004	W-I	LA006-004	1
"R "	RESISTORS				
1	Fixed, comp., 47kohm ±10% ¼W	RC104-347	A-B	CB4731	1
2	Fixed, comp., 56ohm ±10% ¼W	RC104-056	A-B	CB5601	1
3	Fixed, comp., 1.5kohm ±10% ¼W	RC104-215	A-B	CB1521	1
4,17	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1021	2
5	Fixed, comp., 75ohm ±5% ¼W	RC103-075	A-B	CB7505	1
6	Fixed, comp., 3.9kohm ±10% ¼W	RC104-239	A-B	CB3921	1
7,18	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	2
8	Fixed, comp., 33kohm ±10% ¼W	RC104-333	A-B	CB3331	1
9	Fixed, comp., 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1
10	Fixed, comp., 1kohm ±10% ¼W	RC104-210	A-B	CB1021	1
11	Fixed, comp., 8.2kohm ±10% ¼W	RC104-282	A-B	CB8221	1
12	Fixed, comp., 15kohm ±10% ¼W	RC104-315	A-B	CB1531	1
13	Fixed, comp., 1.5Mohm ±10% ¼W	RC104-515	A-B	CB1551	1
14,16	Fixed, comp., 10kohm ±10% ¼W	RC104-310	A-B	CB1031	2
15	Variable, carbon, 20kohm ±20% ¼W	RP124-320	A-B	WA2G032	1
"Q "	TRANSISTORS				
1	NPN, Silicon	QA038-541	G-E	2N3854A	1
2	NPN, Silicon	QB000-013	APX	A430	1
3	N-channel JFET	QA054-580	MOT	2N5458	1
4	NPN, Silicon	QA050-880	MOT	2N5088	1

MARKER SCHEMATIC
M66 59.5/1090/±4.5
REV. A

T.P.3
SWEEP SAMPLE IN J1
R21 56
29.75 MHz
C3 20
L1
Q1 2N3854A
C4 120
X1
C2 47
R1 47K
R2 56
L2
C5 500
R3 1.5K
L3
L4
C7 2
C6 7/35
R4 1K
CR1 IN82
L6 47μH
L5
C8 16
C9 100
R5 33K
C10 7/35
C11 10
CR2 HP5082 2800
R6 1K
C12 .001μF
R7 1M
R8 8.2K
C8 .001μF
Q2 2N5458
R9 1K
R10 15K
R11 1.5M
R12 10K
C14 .01μF
Q3 2N5088
R13 20K
R14 10K
C15 6.8
59.5MHz ±4.5MHz BIRDY OUTPUT
59.5 +18V mA
C1 12 470
T.P.4
54.5 MHz
C18 20
L7
Q4 2N5179
C19 120
X2
C17 47
R15 47K
R16 56
L8
C20 500
R17 1.5K
CR3 IN82
CR4 IN82
L9
L10
L11
C21 10
R18 47K
Q5 2N5179
C22 2
C23 500
R19 1.5K
C24 2
C26 2
L14
R20 1K
CR5 IN82
C25 1.2/10
C27 1.2/10
C28 100
L15 474nH
R22 33K
C29 7/35
C30 10
R23 1K
C31 .001μF
CR6 HP5082 2800
R24 1M
R25 8.2K
C32 .001μF
Q6 2N5458
R26 1K
R27 15K
R28 1.5M
R29 10K
C33 .01μF
Q7 2N5088
R30 20K
R31 10K
C34 6.8
1090MHz ± 4.5MHz BIRDY OUTPUT
1090 +18V mA
C16 8 470
T.P.5
4.5 MHz
C37 200
L16
L18
Q8 2N3854A
C38 .001 μF
X3
C36 47
R32 47K
R33 56
L17
C39 500
R34 1.5K
4.5 +18V mA
C35 10 470

PARTS LIST

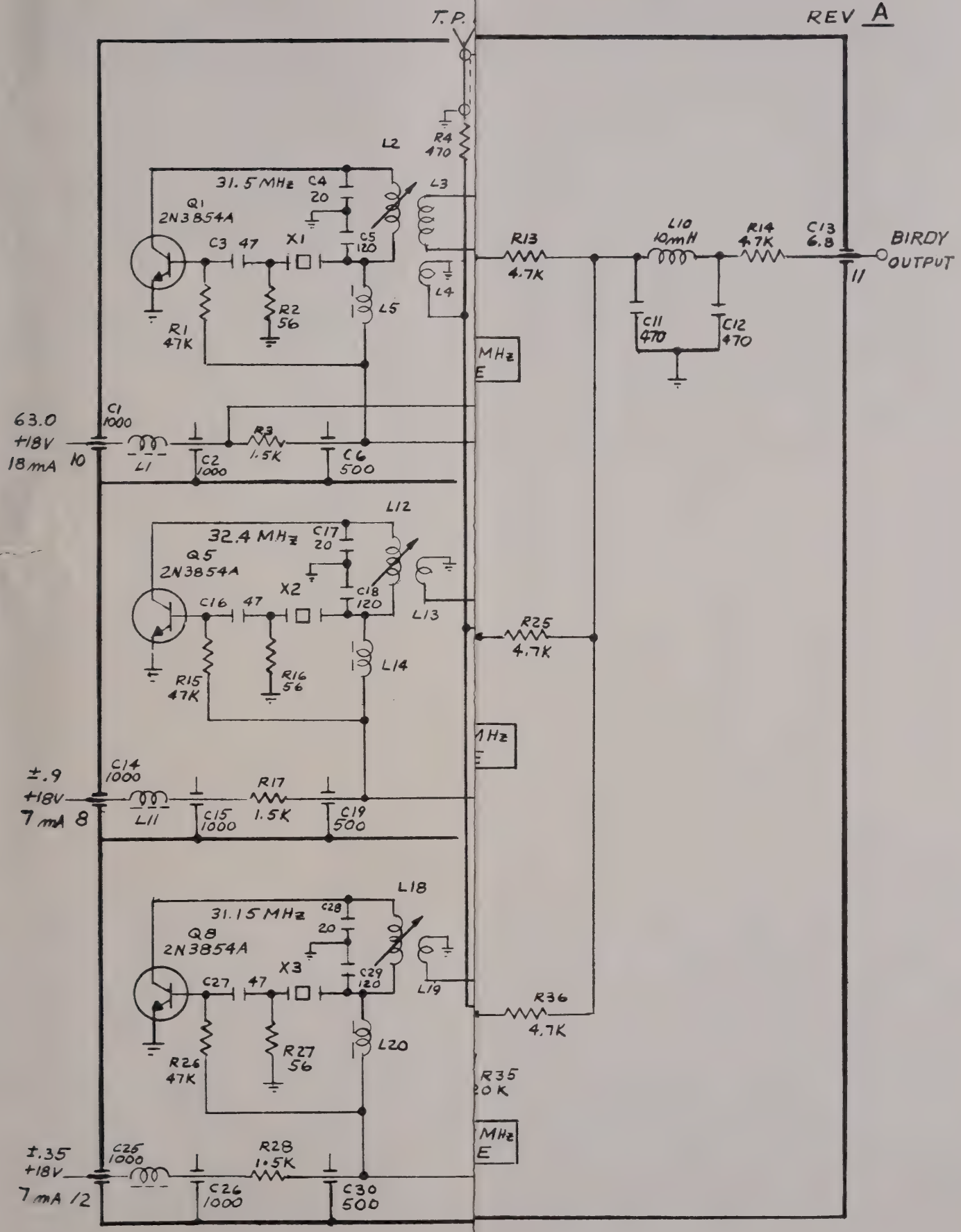
MODULE M66 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
1,15,18,32	Fixed, comp., 47k ohm ±10% ¼W	RC-104-347	A-B	CB4731	4
2,16,21,33	Fixed, comp., 56 ohm ±10% ¼W	RC-104-056	A-B	CB5601	4
3,17,19,34	Fixed, comp., 1.5k ohm ±10% ¼W	RC-104-215	A-B	CB1521	4
4,6,9,20, 23,26	Fixed, comp., 1k ohm ±10% ¼W	RC-104-210	A-B	CB1021	6
5,22	Fixed, comp., 33k ohm ±10% ¼W	RC-104-333	A-B	CB3331	2
7,24	Fixed, comp., 1M ohm ±10% ¼W	RC-104-510	A-B	CB1051	2
8,25	Fixed, comp., 8.2k ohm ±10% ¼W	RC-104-282	A-B	CB8221	2
10,27	Fixed, comp., 15k ohm ±10% ¼W	RC-104-315	A-B	CB1531	2
11,28	Fixed, comp., 1.5M ohm ±10% ¼W	RC-104-515	A-B	CB1551	2
12,14,29,31	Fixed, comp., 10k ohm ±10% ¼W	RC-104-310	A-B	CB1031	2
13,30	Variable, carbon, 20k ohm ±20% ¼W	RC-124-320	A-B	WA2G032	2
"Q "	TRANSISTORS				
1,8	NPN, Silicon	QA-038-541	G-E	2N3854A	2
2,6	N-channel JFET	QA-054-580	MOT	2N5458	2
3,7	NPN, Silicon	QA-050-880	MOT	2N5088	2
4,5	NPN, Silicon	QA-051-790	RCA	2N5179	2

MARKER SCHEMATIC

M66 63.0/±.9/±.35

REV A



PARTS LIST — MODULE M66 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,16,35	Ceramic feedthru, 470pF ±20% 500V	CF-101-147	A-B	FA5C	3
2,17,36	Ceramic disc, 47pF ±5% 1kV	CD-104-047	SPR	10TCU-Q47	3
3,18	Ceramic disc, 20pF ±5% 1kV	CD-101-020	SPR	10TCC-Q20	2
4	Ceramic disc, 120pF ±5% 1kV	CD-104-112	SPR	10TCU-T12	1
5,20,23,39	Ceramic feedthru, 500pF ±20% 250V	CF-104-150	AER	EF4	4
6,10,29	Variable, ceramic, 7/35pF	CV-101-035	STR	S-TRIKO	3
7,22,24,26	Composition 2pF ±10% 500V	CG-101-220	Q-C	Q C	4
8	Ceramic disc, 15pF ±5% 1kV	CD-101-015	SPR	10TCC-Q15	1
9,19,28	Ceramic disc, 100pF ±5% 1kV	CD-104-110	SPR	10TCU-T10	3
11,21,30	Ceramic disc, 10pF ±5% 1kV	CD-101-010	SPR	10TCC-Q10	3
12,13,31,32	Ceramic disc, .001uF ±20% 1kV	CD-102-210	SPR	5GA-D10	4
14,33	Ceramic disc, .01uF ±20% 100V	CD-103-310	SPR	TG-S10	2
15,34	Ceramic feedthru, 6.8pF ±10% 500V	CF-102-R68	A-B	FA5C	2
25,27	Variable, ceramic, 1.2/10pF	CV-103-010	STR	R-TRIKO	2
37	Ceramic disc, 200pF ±5% 1kV	CD-104-120	SPR	10TCU-T20	1
38	Mica, 1000pF ±5% 500V	CM-101-210	A-E	DM19-102J	1
"J "	CONNECTORS				
1	Jack, receptacle, 50 ohm	JF-000-005	APL	27-9	1
"X "	CRYSTALS				
1	29.75 MHz	Y-3	W-I	Y-3	1
2	54.5 MHz	Y-5	W-I	Y-5	1
3	4.5 MHz	Y-2	W-I	Y-2	1
"CR "	DIODES				
1,3,4,5	Silicon, Point contact	DG-100-821	SYL	1N82AS	4
2,6	Silicon, Hot carrier	DG-000-007	H-P	5082-2800	2
"L "	INDUCTORS				
1	Variable ----	Not Assign.	W-I	--------	--
2,8,17	Fixed ----	LA-006-010	W-I	LA-006-010	3
3	Fixed ----	Not Assign.	W-I	---------	--
4	Fixed ----	Not Assign.	W-I	---------	--
5	Fixed ----	Not Assign.	W-I	---------	--
6,15	Fixed, 47uH	LA-001-047	JEF	15	2
7	Variable ----	Not Assign.	W-I	---------	--
9	Variable ----	Not Assign.	W-I	---------	--
10	Variable ----	Not Assign.	W-I	---------	--
11	Variable ----	Not Assign.	W-I	---------	--
12	Fixed ----	Not Assign.	W-I	---------	--
13	Fixed ----	Not Assign.	W-I	---------	--
14	Fixed ----	LA-006-004	W-I	LA-006-004	1
16	Variable ----	Not Assign.	W-I	---------	--
18	Fixed ----	Not Assign.	W-I	---------	--

PARTS LIST — MODULE M66 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
1,15,18,32	Fixed, comp., 47k ohm ±10% ¼W	RC-104-347	A-B	CB4731	4
2,16,21,33	Fixed, comp., 56 ohm ±10% ¼W	RC-104-056	A-B	CB5601	4
3,17,19,34	Fixed, comp., 1.5k ohm ±10% ¼W	RC-104-215	A-B	CB1521	4
4,6,9,20, 23,26	Fixed, comp., 1k ohm ±10% ¼W	RC-104-210	A-B	CB1021	6
5,22	Fixed, comp., 33k ohm ±10% ¼W	RC-104-333	A-B	CB3331	2
7,24	Fixed, comp., 1M ohm ±10% ¼W	RC-104-510	A-B	CB1051	2
8,25	Fixed, comp., 8.2k ohm ±10% ¼W	RC-104-282	A-B	CB8221	2
10,27	Fixed, comp., 15k ohm ±10% ¼W	RC-104-315	A-B	CB1531	2
11,28	Fixed, comp., 1.5M ohm ±10% ¼W	RC-104-515	A-B	CB1551	2
12,14,29,31	Fixed, comp., 10k ohm ±10% ¼W	RC-104-310	A-B	CB1031	2
13,30	Variable, carbon, 20k ohm ±20% ¼W	RC-124-320	A-B	WA2G032	2
"Q "	TRANSISTORS				
1,8	NPN, Silicon	QA-038-541	G-E	2N3854A	2
2,6	N-channel JFET	QA-054-580	MOT	2N5458	2
3,7	NPN, Silicon	QA-050-880	MOT	2N5088	2
4,5	NPN, Silicon	QA-051-790	RCA	2N5179	2

MARKER SCHEMATIC

M66 63.0/±.9/±.35

REV A

T.P. 6

SWEEP SAMPLE IN

J1

R8 51

L8 2.2NH

R9 1K

R5 1K

Q3 2N3854A

L2

R4 470

31.5 MHz

C4 20

L3

Q1 2N3854A

C3 47

X1

C5 120

L6

Q4 40841

C10

L9 510NH

.05μF

R11 2.2K

L4

L5

R6 1K

Q2 2N3854A

R7 1K

C7 .001μF

L7

C8 20

63MHz

C9 .05μF

R10 1.5K

R1 47K

R2 56

R12 20K

R13 4.7K

L10 10mH

R14 4.7K

C13 6.8

BIRDY OUTPUT

11

C11 470

C12 470

63.0 MHz SIZE

63.0 +18V 18mA 10

C1 1000

L1

C2 1000

R3 1.5K

C6 500

T.P. 5

L12

32.4 MHz

C17 20

Q5 2N3854A

X2

C16 47

C18 120

L13

L14

R15 47K

R16 56

R18 470

Q6 40841

C21 20

L15

R20 2.2K

C22 180

900KHz

C20 .05μF

R19 330

R21 2.2K

Q7 40841

C24 .05μF

R25 4.7K

R24 20K

L16 510 NH

C41 47

C23 .05μF

R22 1K

R23 2.2K

±.9 MHz SIZE

±.9 +18V 7mA 8

C14 1000

L11

C15 1000

R17 1.5K

C19 500

T.P. 4

L18

31.15 MHz

C28 20

Q8 2N3854A

X3

C27 47

C29 120

L19

L20

R26 47K

R27 56

R29 470

Q9 40841

C32 47

L21

R31 2.2K

C33 820

350KHz

C31 .05μF

R30 330

R32 2.2K

Q10 40841

C36 .05μF

C38 180

L23 510μH

C37 .002 μF

C39 470

C40 .001μF

R36 4.7K

R35 20K

R34 2.2K

C34 470

L22 510

C35 .05 μF

R33 1K

±.35 MHz SIZE

±.35 +18V 7mA 12

C25 1000

R28 1.5K

C26 1000

C30 500

PARTS LIST

MODULE M66 63.0 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
11,20,21,23 31,32,34	Fixed, comp., 2.2k ohm ±10% 1/4W	RC104-222	A-B	CB2221	7
12,24,35	Fixed, comp., 20k ohm ±10% 1/4W	RP130-320	BEK	89PR20K	3
13,14,25,36	Fixed, comp., 4.7k ohm ±10% 1/4W	RC104-247	A-B	CB4721	4
19,30	Fixed, comp., 330 ohm ±10% 1/4W	RC104-133	A-B	CB3311	2
"Q "	TRANSISTORS				
1,2,3,5,8	NPN, Silicon	QA038-541	G-E	2N3854A	5
4,6,7,9,10	N channel IG FET	QB000-020	RCA	40841	5

PARTS LIST — MODULE M66 63.0 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,2,14,15 25,26	Ceramic feedthru 1000pF, 500V	CF112-210	A-B	FA5C	6
3,16,27,32, 41	Ceramic disc., 47pF ±5% 1kV	CD104-047	SPR	10TCU-Q47	5
4,8,17,21,28	Ceramic disc., 20pF ±5% 1kV	CD101-020	SPR	10TCC-Q20	5
5,18,29	Ceramic disc., 120pF ±5% 1kV	CD104-112	SPR	10TCU-T12	3
6,19,30	Ceramic feedthru 500pF ±20% 250V	CF104-150	AER	EF4	3
7,40	Ceramic disc., .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	2
9,10,20,23, 24,31,35,36	Ceramic disc., .05uF ±20% 1kV	CD102-350	SPR	TG-S50	8
11,12,34,39	Ceramic disc., 470pF ±20% 1kV	CD102-147	SPR	5GA-T47	4
13	Ceramic feedthru 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	1
22,38	Mica, 180pF ±5% 500V	CM101-118	A-E	DM19 181J	2
33	Mica 820pF ±5% 500V	CM101-182	A-E	DM19 821J	1
37	Ceramic disc., .002uF ±20% 1kV	CD102-220	SPR	5GA-D20	1
"J "	CONNECTORS				
1	Jack, receptacle, 50 ohm	JF000-005	APL	27-9	1
"X "	CRYSTALS				
1	31.5 MHz	Y-8	W-I	Y-8	1
2	32.4 MHz	Y-10	W-I	Y-10	1
3	31.15 MHz	Y-9	W-I	Y-9	1
"L "	INDUCTORS				
1,11,17	Fixed	LA006-010	W-I	LA006-010	3
2,12,18	Variable	Not assign	W-I	---------	--
3	Fixed	Not assign	W-I	---------	--
4,13,19	Fixed	Not assign	W-I	---------	--
5,14,20	Fixed	LA006-004	W-I	LA006-004	3
6	Fixed	Not assign	W-I	---------	--
7	Variable	Not assign	W-I	---------	--
8	Fixed 2.2uH	LA001-R22	JEF	15	1
9,16,22,23	Fixed, 510uH	LA002-151	JEF	19	4
10	Fixed, 10mH	LA004-310	JEF	15S103K	1
15,21	Variable	Not Assign	W-I	---------	2
"R "	RESISTORS				
1,15,26	Fixed, comp., 47kohm ±10% 1/4W	RC104-347	A-B	CB4731	3
2,16,27	Fixed, comp., 56 ohm ±10% 1/4W	RC104-056	A-B	CB5601	3
3,17,28,10	Fixed, comp., 1.5k ohm ±10% 1/4W	RC104-215	A-B	C B1521	4
4,17,29	Fixed, comp., 470 ohm ±10% 1/4W	RC104-147	A-B	CB4711	3
5,6,7,9,22 23	Fixed, comp., 1k ohm ±10% 1/4W	RC104-210	A-B	CB1021	6
8	Fixed, comp., 51 ohm ±5% 1/4W	RC103-051	A-B	CB5103	1

PARTS LIST — MODULE M66 63.0 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"R "	RESISTORS				
11,20,21,23 31,32,34	Fixed, comp., 2.2k ohm ±10% 1/4W	RC104-222	A-B	CB2221	7
12,24,35	Fixed, comp., 20k ohm ±10% 1/4W	RP130-320	BEK	89PR20K	3
13,14,25,36	Fixed, comp., 4.7k ohm ±10% 1/4W	RC104-247	A-B	CB4721	4
19,30	Fixed, comp., 330 ohm ±10% 1/4W	RC104-133	A-B	CB3311	2
"Q "	TRANSISTORS				
1,2,3,5,8	NPN, Silicon	QA038-541	G-E	2N3854A	5
4,6,7,9,10	N channel IG FET	QB000-020	RCA	40841	5